

OCTOBER, 1951

MODERN Machine Shop

BROACHES and

Complete Broach Service



ENGINEERING

Our estimating and design engineers will analyze your broaching jobs, present or proposed, and give you actual cost and production data on new tooling . . . you know your savings beforehand.

MANUFACTURING

Every size and type of broach is manufactured in our modern plant. Highest standards of quality are assured through specialized equipment and processes from roughing operations through final inspection.

SERVICE

Detroit Broach field engineers are prompt to give you help when needed on broaching jobs in your plant. We also will setup and tryout your new broach tooling . . . thus assuring most efficient production.

BROACHING FIXTURES

that's all we make!

Detroit Broach Company has always designed and built broach tooling exclusively . . . for every type, size and make of broaching machine.

This specialization thoroughly qualifies our engineers to give sound, unbiased recommendations on broaching procedures and tooling . . . it also means more efficient manufacture of broach tooling since our modern plant is equipped and manned specifically for that single purpose. These two factors are extremely important to you because they provide assurance that your broaching problems are in the hands of highly experienced specialists . . . and such specialization is necessary to obtain greatest all-round efficiency and economy from broaching applications.

DETROIT *Broach* COMPANY

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WORLD'S LARGEST MANUFACTURER OF

BROACHES AND BROACH TOOLING EXCLUSIVELY

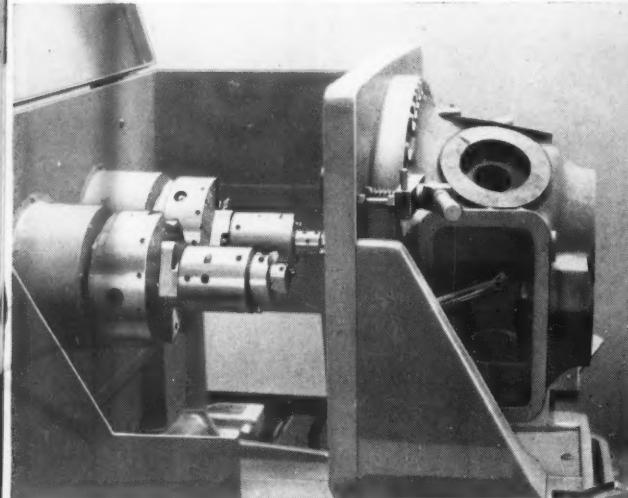


**When the heat's on for
civilian or defense production**

HEALD PRECISION helps to KEEP 'EM FLYING

In aircraft production, quality and precision take precedence over all other factors. But speed can be mighty important, too. Heald machines meet both of these requirements—turning out precision finished parts with the highest degree of accuracy, at production rates consistent with customer requirements.

Whether it's a reciprocating or jet type engine—for civilian or military use—Heald can supply the equipment and experience that will smooth the way to faster, easier and better production. Remember—when it comes to precision finishing, it pays to come to Heald.



Heald Model 321 Bore-Matic performs multiple precision borizing operations on magnesium accessory cases for aircraft engines.

**New Heald Bore-Matic
Gets Aircraft Engine Production
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1. Ready Adaptability of Heald engineering to new applications.
2. Smooth Performance of basic machine and equipment.
3. Constant Feed Hydraulics maintain consistent feed rates throughout longest runs.



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VOLUME 24

NUMBER 5

OCTOBER, 1951

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MODERN Machine Shop Contents

Features in This Issue	123
Chrysler "FirePower" Engine Production	124
By Howard Campbell	
Sub-Zero Chilling as a Metallurgical Process	140
By Rolland S. Jamison	
Thermal Distortion, Deflection and Vibration in Machine Tools, Part I	178
By Dr. Max Kronenberg	
Precision Routing	202
By Gilbert C. Close	
Community Relations	222
By Bartlett West	
Simple Back-Up Device Facilitates Arc Welding of Box Sections	234
By H. G. Frommer	
Faster Press Operations	240
By C. W. Hinman	
Little Chats on Practical Psychology	250
33rd National Metal Congress and Exposition	256
Program of ASM Technical Papers	260
Program of AWS Technical Papers	270
Program of AIME Technical Papers	280
Program of SNT Technical Papers	286
List of Exhibitors	288
On Exhibit at the Metal Show	300
News of the Industry	316
Services Directory	414
"Where to Get It"	416
Over the Editor's Desk	426
Index to Advertisements	428

PRECISION *plus*

...threads cut to Class 7 tolerances

Continuous threads cut on studs must meet exacting requirements to withstand the high pressures and temperatures to which pressure vessels, steel pipe flanges, fittings, and valves are subjected.

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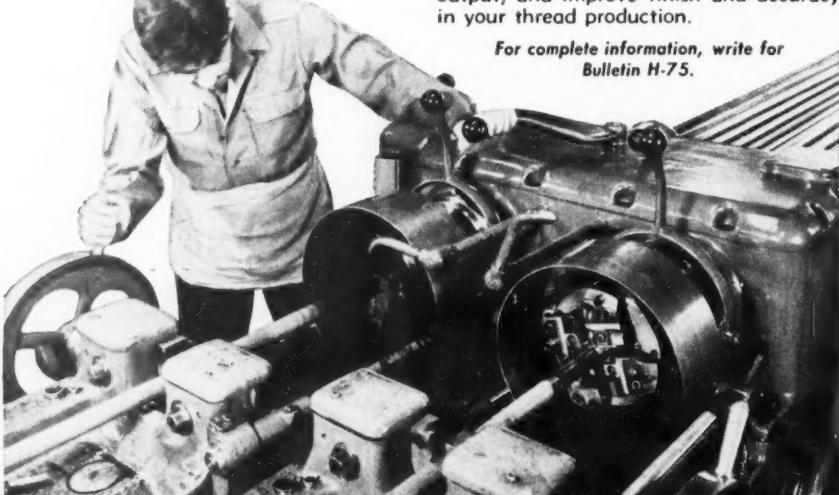
By using Double Head LANDMACO Leadscrew Threading Machines equipped with Hardened and Ground 2" LANCO

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Having given many similar outstanding performances in other fields, LANDMACO Machines can help to cut costs, step up output, and improve finish and accuracy in your thread production.

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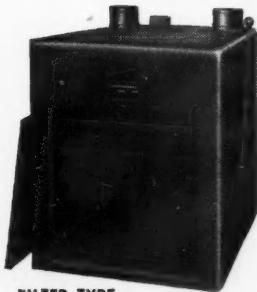
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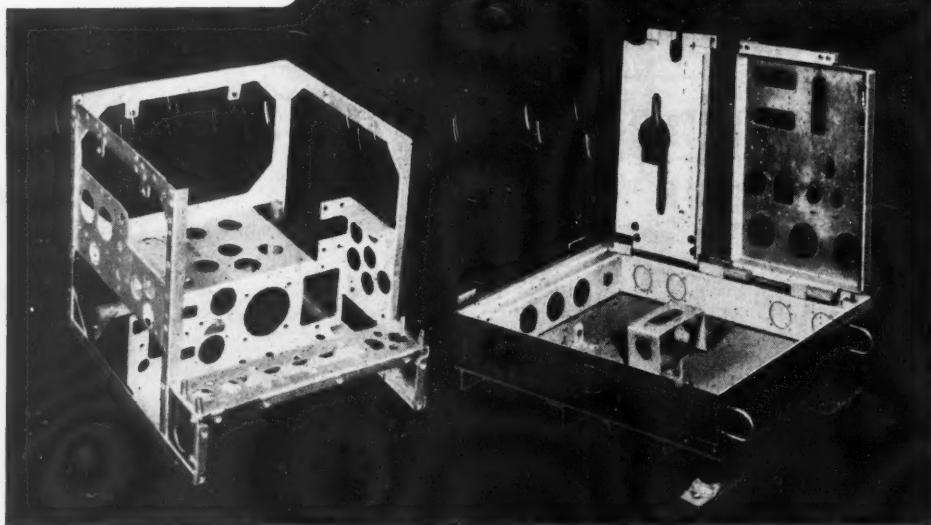
These units trap dangerous dust before it can harm the health and efficiency of your employees and damage valuable machinery . . . These two distinct types of Duskolectors offer the best and most economical solutions to your special dust problems. Hammond experience will help you too, in eliminating the dust menace . . . Write today for bulletin.

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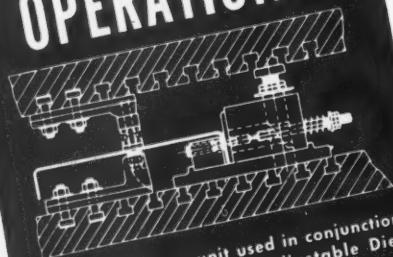
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HU-50 Perforating unit used in conjunction
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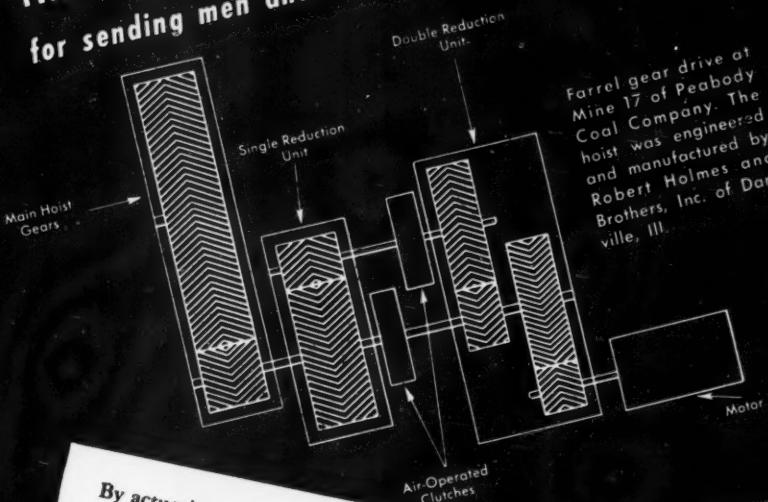
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Farrel gear drive of
Mine 17 of Peabody
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hoist was engineered
and manufactured by
Robert Holmes and
Brothers, Inc. of Dan-
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By actuating one or the other of two air-operated clutches, this mine hoist can be run at either of two speeds. For handling machinery at the lower speed, all of the Farrel gears are used to provide a total speed reduction of 144 to 1. For carrying men, the higher hoist speed is used by cutting out the single reduction unit and the second pair of gears

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Farrel-Sykes herringbone gears were selected for this installation because of their quiet, vibration-free performance and long-life dependability. These gears are available in any size from $\frac{1}{4}$ inch to 20 feet diameter, for any application.

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FB-677

CHECK THREAD ACCURACY, ASSEMBLE-ABILITY Visually WITH THE H-W Dual THREAD COMPARATOR

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1. FULL THREADED GAGING POSITION checks lead, angle and pitch diameter cumulatively for accurate test of assemble-ability.
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BHW81

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Wide clearance around wheels permits the grinding of odd-shaped pieces.

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MANUFACTURING
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\$4100

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This new BALDOR GRINDER No. 619 is powered with capacitor-start, capacitor-run motor ($\frac{1}{3}$ or $\frac{1}{4}$ h.p., 3400 r.p.m.) which will not burn out even though repeatedly overloaded. Ball-bearings lubricated for life. 6" wheels equipped with Baldor patented weights for perfect balance. Adjustable steel tool rests.

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Baldor

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**ABOUT CINCINNATI MILLING
SURFACE BROACHING
DIE SINKING • GRINDING
CUTTER SHARPENING • LAPING
FLAME HARDENING MACHINES**

You can save time by telephoning or writing the nearest Cincinnati representative for literature and information about the machines listed above. For your convenience, addresses and telephone numbers are tabulated here. Why not just tear out these two pages and keep them for future reference? And while you're about it, ask for a copy of our new general catalog, No. M-1712. You'll need it for reference throughout the year.

**THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO**



Our new general catalog No. M-1712 contains information and specifications for all machines in the Cincinnati line. A copy will be sent on request.



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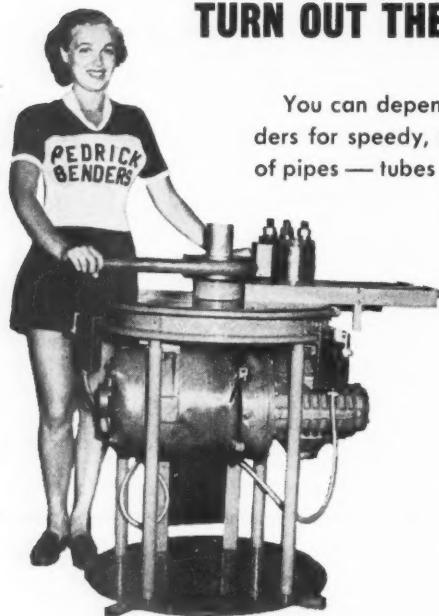
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They are proving their efficiency and economy right on the production line every day. Rely on Pedrick for speed, accuracy and versatility.

Equipped with relay controls, for semi-automatic duplicate bending — they handle pipe up to 6" extra heavy — have no clamps — require no special skills — eliminate the cost of expensive tools.

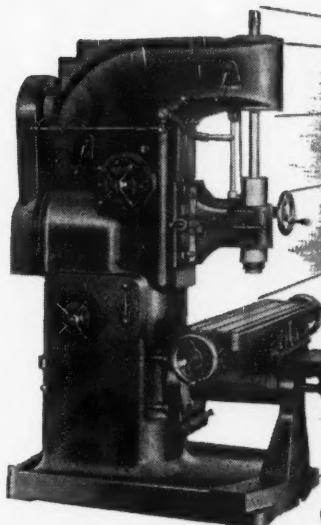
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NO.
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Here's Why

- ① A tilting, swivel table that entirely eliminates special jigs, angle plates and other expensive fixtures usually required for special or complicated milling, boring or shaping jobs.
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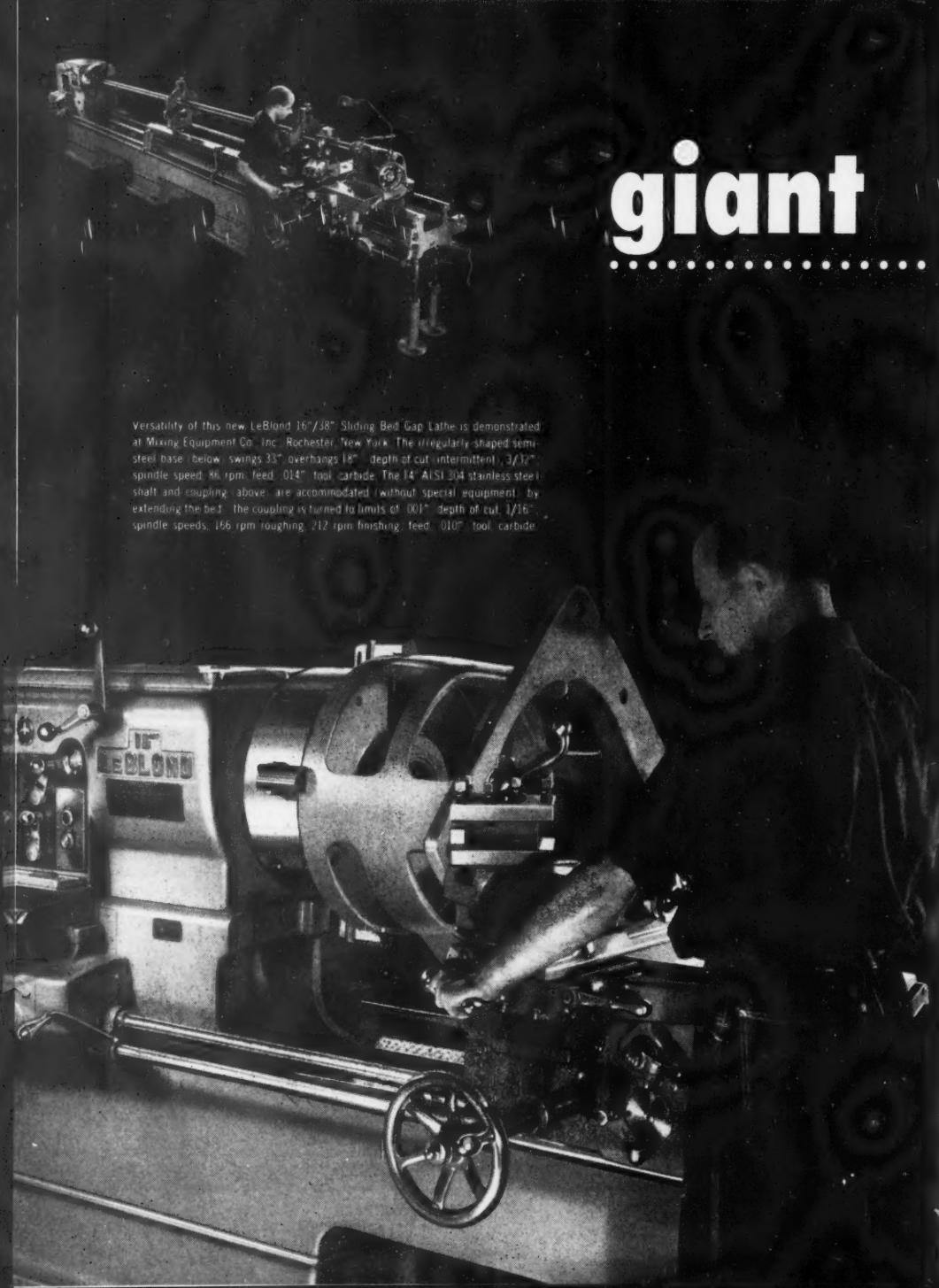
W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis

Send catalog on Knight No. 40 and other milling machines.

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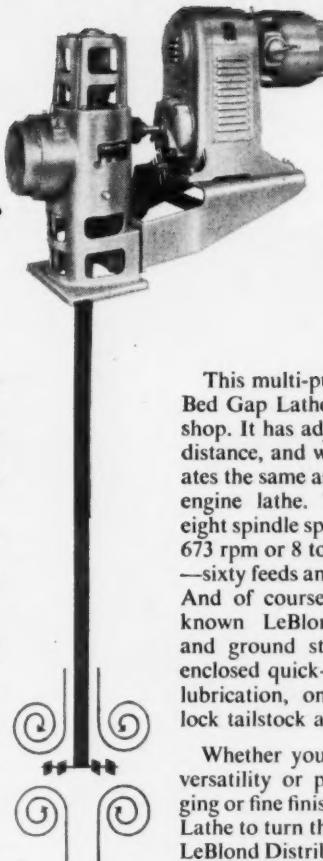
Versatility of this new LeBlond 16" x 38" Sliding Bed Gap Lathe is demonstrated at Mixing Equipment Co., Inc., Rochester, New York. The irregularly shaped semi-steel base (below) swings 33" overhangs 18", depth of cut intermittent, 3/16" spindle speed, 84 rpm feed, .014" tool carbide. The 14" AISI 304 stainless steel shaft and coupling (above) are accommodated (without special equipment) by extending the bed. The coupling is turned to limits of .001" depth of cut, 1/16" spindle speeds, 166 rpm roughing, 212 rpm finishing, feed, .010" tool carbide.

"eggbeaters"

for industry

These huge mixers (up to 500 hp) do a big job of "eggbeating" for industry. They're used to blend chemical formulations—to mix pulp for paper—to combine ingredients for thousands of everyday products.

In producing these mixers, Mixing Equipment Co., Inc. of Rochester, New York, has to turn a variety of work . . . from short parts with irregular swings up to 33", to shafts as long as 14'—materials from brass to stainless steel—intermittent cuts to heavy roughing cuts to smooth finishing cuts—tolerances down to .001". All this calls for a rugged precision lathe of unusual versatility. That's why Mixing Equipment Co., Inc. installed a new LeBlond 16"/38" Heavy Duty Sliding Bed Gap Lathe, recommended by LeBlond Distributor, F. W. Schiefer Machinery Company of Rochester.



This multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. It has adjustable gap and center distance, and with bed closed, it operates the same as a standard heavy duty engine lathe. Twenty-four or forty-eight spindle speeds are available, 11 to 673 rpm or 8 to 1010 rpm, respectively—sixty feeds and threads—up to 15 hp. And of course you get all the well-known LeBlond features—hardened and ground steel bed ways, totally-enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them faster, better. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50" and 32"/60". Call him or write—

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

Ask for Bulletin SBG 103 E
for complete information on
LeBlond Heavy Duty Sliding Bed Gap Lathes.

turned faster by

LEBLOND
of Cincinnati

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not a ripple

IN THIS

OPERATION

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Finest for SPEED: Taps more quality threads per hour, more holes than any other tapping attachment.

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TORQOMATICS, when used with Jarvis TECNI-TAPS, make the finest possible combination for low-cost, high-quality tapping. Send for free, illustrated, descriptive literature to The Charles L. Jarvis Company, Middletown, Conn.

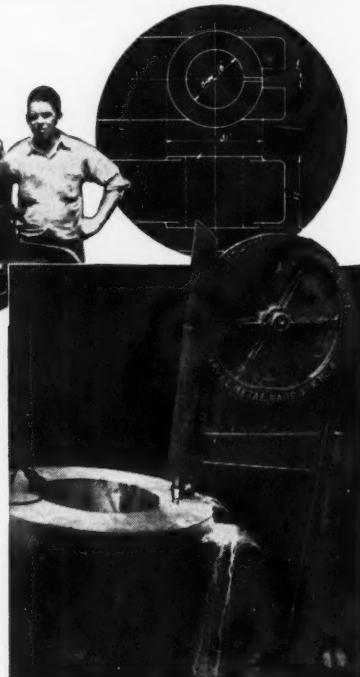


TAPPING ATTACHMENTS • TECHNI-TAPS and DIES • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES •

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT



This is another of the
"HUNDREDS OF JOBS"
which can be done only on a
MARVEL Band Saw!



MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the \$64 question—how to machine out the $1\frac{1}{4}$ " slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of $6\frac{1}{2}$ ".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model No. 8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of \$3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG



ARMSTRONG - BLUM MFG. CO.
5700 Bloomingdale Ave., Chicago 39, Illinois

These exclusive MARVEL
features made this
job easy:

1. Large, T-slotted work table.
2. Blade feeds into work vertically; work always stationary.
3. Power-pressure feed.
4. Automatic blade tension.
5. Built-in coolant system.
6. Large capacity.



**How to Cut
Flat Surface
Grinding Costs
of Large, Heavy Castings**

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102MS

Complete Range of Sizes From 18" to 72" Diameters

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Sing a Song of
Surface Plates

General Manager



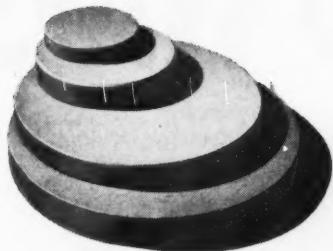
Chief
Inspector



Purchasing Agent Superintendent

they all sing praises of

NORTON
Surface Plates



If you haven't yet heard a song about surface plates, it may be because you haven't adopted Norton Ceramic Surface Plates in your plant.

We cannot guarantee that you will develop a quartet to join the Society for the Preservation of Barbershop Singing in America, but you can be sure of finding four who will sing the praises of Norton Ceramic Surface Plates.

Your General Manager—and other top management men—will find these hardest of all surface plates in tune with today's needs for maximum production with optimum accuracy. Made of one of the hardest substances known, these ceramic surface plates show off to best advantage on your severest production gaging and bluing operations.

Your P. A. will be humming with satisfaction over the way these ceramic surface plates pay off in extra-long, trouble-free service. In both laboratory and field tests Norton surface plate life has been shown to be at least 40 times that of the best competing type.

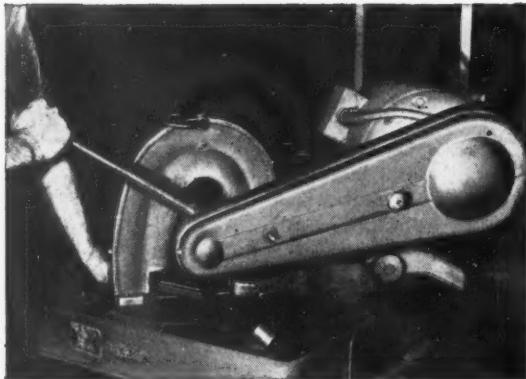
Your Superintendent will like the harmony in his department that comes from men working with the easy-to-use Norton Ceramic Surface Plates. These plates will never sweat nor corrode under any conditions. Greasing is unnecessary and the plates require no protection from moisture. Made of a durable and stable material, Norton surface plates will not warp nor deform; will never give expansion troubles; will not deflect under load.

Your Chief Inspector will really sing for joy over the aid to precision checking operations given by these ceramic surface plates. Offering a new precision standard of continuously smooth surface finish, Norton surface plates allow easy movement of instruments and work across the plate without excessive drag and without vibration. The precision flatness of these ceramic surface plates not only is important to precision measuring operations but also helps prevent wear of expensive instrument bases, gage blocks, and sine bars.



**NORTON COMPANY, WORCESTER 6, MASS.
DISTRIBUTORS IN ALL PRINCIPAL CITIES**

3 TESTED WAYS

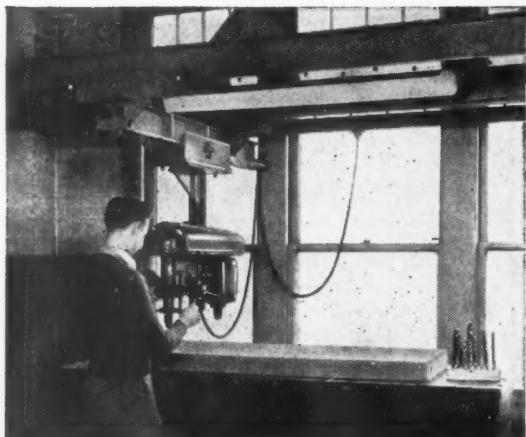


Automotive moulding cut-off
speeded 1000%

FOUR WHEEL DRIVE AUTO COMPANY

Clintonville, Wis.

All metal moulding used for truck cabs is cut on Delta abrasive wheel cut-off machine, with ten times faster production. Previous hand cutting methods entailed great operator fatigue and required a deburring operation. Delta cut-off machines are also available with saw blades for non-ferrous work.



Overhead mounting for
Delta drill press reduces
handling of bulky panels

KIRKHOFF ELECTRIC CO.

Grand Rapids, Mich.

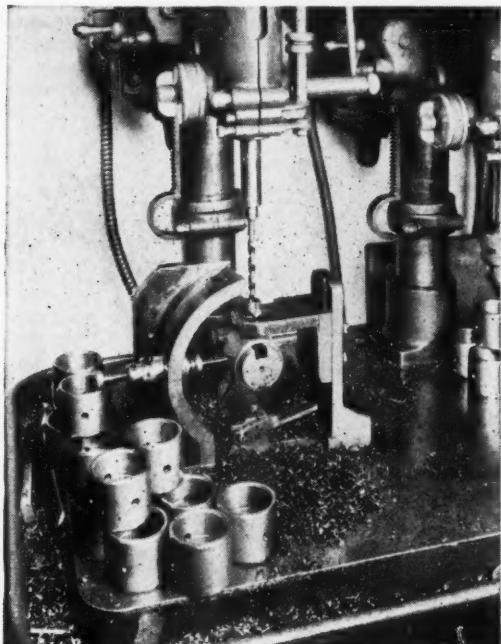
With an overhead crane mounting, a Delta 17-inch drill press will drill holes in any location on 36" x 96" switchboard panels without moving the panels. Both the drill head and bridge are suspended from ball bearings riding on flat cold rolled bars; and the whole framework is supported from the building steel structure for a clear field of operation. Panels are 1½" ebony asbestos or ¼" steel.

There's a Delta Power Tool for Your Job-

WOOD OR METAL WORKING

53 MACHINES — 246 MODELS — MORE THAN 1300 ACCESSORIES

to Save Time, Space or Handling with **DELTA TOOLS**



With one fixture,
Delta drill press handles
57 different parts-

REED-PRENTICE CORP.

Worcester, Mass.

A single ingenious jig, easily and quickly adjustable, is used to drill equally spaced holes in 57 different parts, with a big saving in tool storage space and manufacturing time. An arbor-holding bracket is adjustable horizontally and vertically, and an indexing pin in a double quadrant, inserted in the first hole drilled, locates the next hole accurately.

Delta users originate many unique and practical applications because Delta tools are so adaptable to so many jobs. Your Delta dealer will help you fit them to your own machining requirements. He's listed in the classified section of your phone book —under "Tools."



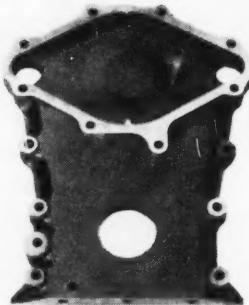
DELTA POWER TOOL DIVISION
Rockwell MANUFACTURING COMPANY

603L E. VIENNA AVENUE • MILWAUKEE 1, WISCONSIN



Here's the part

Front cylinder cover for
popular automobile engine.



FIRST CYCLE

Station 1: Load on piece
 Station 2: Horizontal Head—
 Drill 3 holes $\frac{5}{16}$ " diameter
 Drill 8 holes $\frac{17}{32}$ " diameter
 Bore 1.80" diameter

Station 3: Horizontal Head—
 Drill 4 holes $\frac{13}{32}$ " diameter
 Chamfer 3 holes for $\frac{3}{8}$ —16 tap
 Drill one hole for .1563 diameter ream

Station 4: Horizontal Lead Screw Tap Head—
 Tap 3 holes $\frac{3}{16}$ —16
 Ream one hole .1563"

SECOND CYCLE

Station 1: Transfer and load
 Station 2: Horizontal Head—
 Drill 3 holes .257 diameter for $\frac{5}{16}$ —18 tap

Station 3: Horizontal Head—
 Chamfer 3 holes for $\frac{5}{16}$ —18 tap
 Vertical Head—
 Rough bore and chamfer 2.558" diameter

Station 4: Horizontal Lead Screw Tap Head—
 Tap 3 holes $\frac{5}{16}$ —18 tap
 Vertical Head—
 Finish bore 2.558" diameter



Here's the machine



Illustrated is a MORRIS four-way machine with a 36-inch automatic indexing table. The 34-spindle machine performs a two-cycle operation with four two-position hand clamp fixtures. Produces 88 parts per hour at 80% efficiency.



"A better product at less cost—
with MORRIS PRECISION plus PRODUCTION"

If your work requires numerous drilling, reaming, tapping and boring operations on a mass production basis, your inquiry is invited.

THE
MORRIS
MACHINE TOOL COMPANY

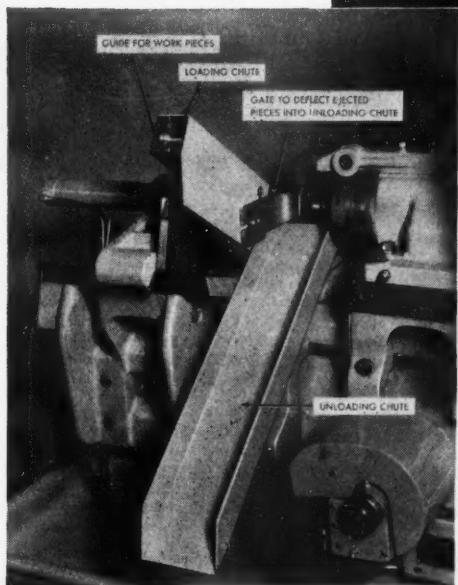
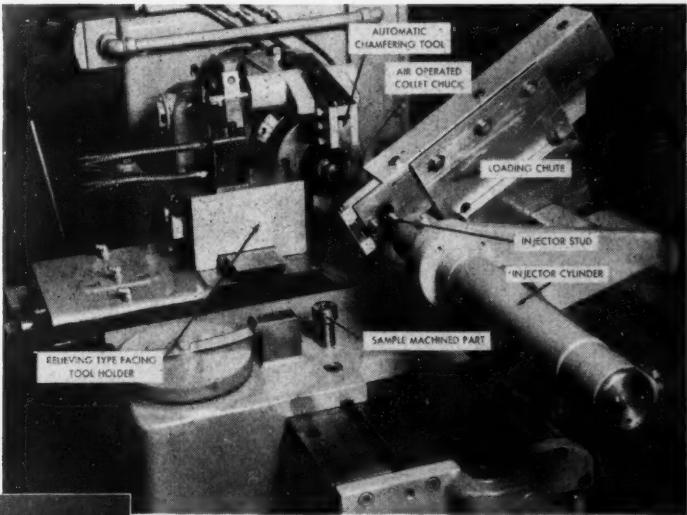
934 Harriet Street • Cincinnati 3, Ohio

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Automatic Loading enables the machine to produce to its full mechanical efficiency by eliminating the human equation.

AUTOMATICALLY LOADED IMP LATHES CUT MANUFACTURING COSTS



Problem: To finish face and chamfer bore of pump gear true with bearing diameter.

Solution: A Lo-swing IMP Lathe was fitted with an injector type automatic loader which provides a fast, completely automatic cycle, entirely eliminating hand loading.

Partially machined pump gears are placed in a loader chute and fed by gravity to the loader injector arm which picks up and places the part in an air operated collet chuck.

A relieving type tool block on the front slide performs the facing operation, then is automatically relieved during the return stroke to avoid spiral tool marks. The chamfering operation is done with a swinging type tool block on the headstock, automatically operated by a cam mechanism working in conjunction with the front cross slide. On completion, the pump gear is automatically ejected by a plunger located in the bore of the spindle.

Lo-swing Lathes fitted with Automatic Loaders are usually grouped together in series of two or more, since one operator can easily service several machines. Let Seneca Falls engineers help cut your turning costs.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

METAL CUTTING
BAND SAWS

Regular—Skip Tooth
Spring Temper

SOLID TOOTH SAWS

SEGMENTAL
TYPE SAWS

[All 3 Types of Saws
Also Furnished with Carbide Tips]

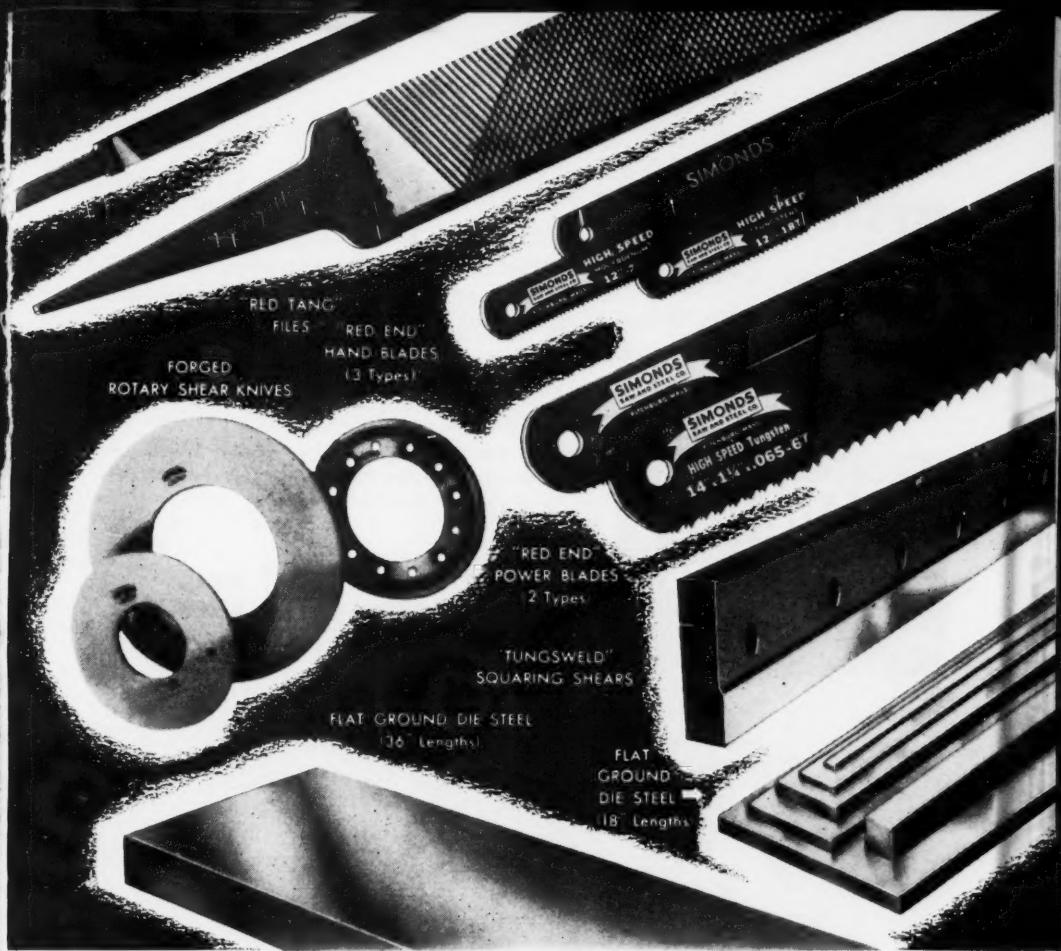
If You Cut Metal **CUT MORE** with **SIMONDS** **Industrial Line**

Over 100 years devoted to the ideal of developing the foremost line of cutting tools in this country . . . that's what underwrites every purchase you make of any product in the Simonds Line.

And don't forget this: You get 100% Simonds Quality Control . . . beginning with steels processed for your job from Simonds own steel mills . . . and going all the way through Simonds famous Windowless Plant (first in this country).

Here, in this completely controlled-conditions plant, modern straight-line production methods are

The Simonds Line is



implemented by special equipment to produce cutting tools of one quality only . . . Simonds TOP Quality.

And you can bank on it that these Simonds Tools will deliver top performance on any job . . . from hand filing and hacksawing, to production machine cutting with saws of all types and sizes. So, if low-cost and high-level production are vital to you . . . then specify "Simonds" to your distributor or dealer on any requirement you may have on which the tools shown above will serve.

Remember: You start to save, the minute you say SIMONDS!

**SIMONDS
SAW AND STEEL CO.**

Branch Offices in Boston, Chicago, San Francisco and
Portland, Ore. Canadian Factory in Montreal, Que.

the Production Line

PROMATIC takes the
MYSTERY out of
Centerless Grinding

...and saves dollars
spent on "OUTSIDE" costs!

Centerless grinding need not be mysterious —full of tricks and secret know-how. PROMATIC removes the complications. There's nothing to get out of order—no maintenance more difficult than mounting a grinding wheel. And dollars spent on "Outside" work soon pay off this economical investment.

Before you buy any centerless grinder investigate PROMATIC. Built for PRECISION, Built for VALUE, Built for SAVINGS!

PROMATIC
CENTERLESS
GRINDER



HANDLES
WORK UP TO
1½ INCHES O.D.
(WITH 5 H.P.
MOTOR)

**DIVERSIFIED METAL
PRODUCTS CO.**

5125 Alcoa Ave., Los Angeles 58, Calif.

Production up from 80 to 300 pieces per hour with a Warner & Swasey 5-Spindle Automatic

● In 1940 Badger Meter Manufacturing Company of Milwaukee worked three shifts to turn out their required production. Today they are able to achieve the same output with one shift, using the same floor space for production.

Practically all of these results are due to more efficient machine tools.

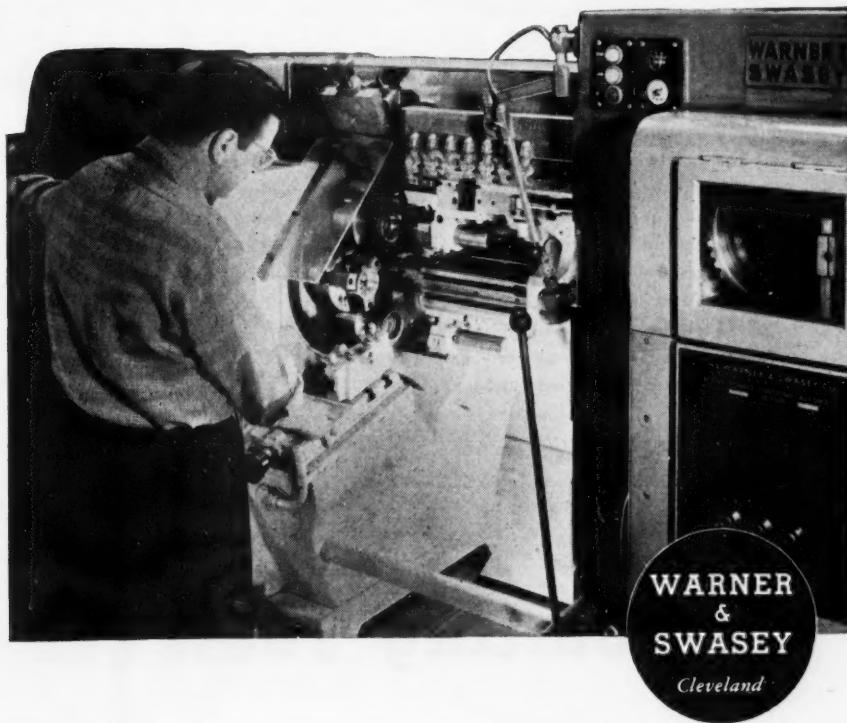
For instance, when Badger installed a Warner

& Swasey 5-Spindle Automatic Chucking Machine, they had one main purpose in mind—to step up production. It did just that. Output on the standard register housing, used on all Badger meters for liquids, rose from 80 to 300 pieces per hour! In addition, better surfaces and closer tolerances were attained.

Badger, like many a manufacturer who is hard

pressed for production during these critical days, has found the Warner & Swasey 5-Spindle Automatic an answer to a prayer. For in addition to improving work quality and stepping up production, it does this with fewer operators.

If these facts hit home, call in your nearest Warner & Swasey Field Representative. He'll be glad to help you boost your man-hour output.



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

For a Mirror-finish ... here's a reflection of

on every Reaming Job

Yes, here's the kind of finish you get on Morse Reamers and for every reaming job. And that's because these precision Morse Cutting Tools are made to closest tolerances, from top-quality steels . . . to give you 100% performance *on a production basis*, in either hand or machine operations. For even greater production, specify Morse Electropolished Reamers.

A full line of Morse Reamers is avail-

able. Just remember, that if you want Morse Quality, then be absolutely sure you are getting genuine Morse Tools. See your Morse-Franchised Distributor . . . and he'll see that your requirements are filled *exactly*.

Morse Twist Drill & Machine Company
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)

Warehouses in New York, Chicago, Detroit, San Francisco

MORSE | Cutting Tools



October, 1951

MODERN MACHINE SHOP 29

TROYKE ROTARY TABLES



STANDARD MODELS WORM WHEEL OPERATED ROTARY TABLES

Five sizes: 9", 12", 15", 18", 21".
For Die Sinking, Jig Boring, Cam
Milling. Indispensable in wood and
metal pattern shops.



HEAVY DUTY MODELS WORM WHEEL OPERATED ROTARY TABLES

Three sizes: 18", 21", 25".

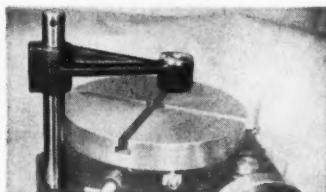
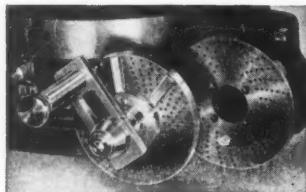
These larger, heavy duty models
are used for Jig Work, Planer Jobs,
and on Horizontal Boring Mills.



STATION INDEXING BALL BEARING ROTARY TABLES

Three sizes: 12", 15", 18".

These models are used for drilling
and milling operations when quick
and positive station indexing is re-
quired.



Dividing Attachments can be furnished for
all models of Wormwheel Operated Rotary
Tables except the Model BH-9.

Drilling Attachments can be furnished
for all Wormwheel Operated and
Station Indexing Rotary Tables.

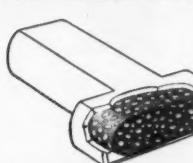
QUALITY PRODUCTS AT THE LOWEST PRICES



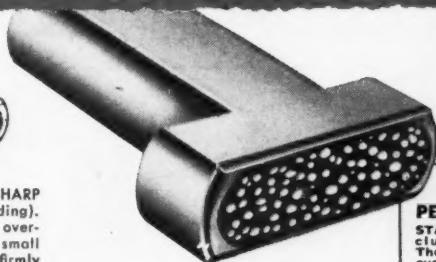
TROYKE MFG. CO., CINCINNATI 9, OHIO

See your dealer or write us for complete catalogs.

Inexperienced Operators Can't Abuse These Diamond Tools!



Enlarged view shows STA-SHARP Diamond Tool (Patent pending). Phantom view above shows overlapping layers of selected small SOLID diamonds which are firmly locked in place in a special matrix by exclusive bonding process.



70 DIAMONDS PER SQUARE INCH!

STA-SHARP tools are NOT cluster diamond tools. They are made with many overlapping layers of fine individual solid diamonds. The cutting face of each STA-SHARP presents not less than 70 solid diamonds per square inch.

New STA-SHARP Diamond Tools

Save up to 50% on your Diamond Costs

STA-SHARP tools are abuse-proof! Even the most inexperienced operator can't wreck these diamond tools by carelessness or incorrect use. The diamonds in these tools do not get dull. These must not be turned, require no supervision. They always do a good trueing and dressing job until completely used up.

With the exclusive STA-SHARP design, as the top layer of diamonds wears down, the next overlapping layer comes into cutting position. While passing across the face of the wheel, as the forward diamonds wear down, the following diamonds maintain gage and give a true concentric and parallel wheel. This eliminates fading. STA-SHARP tools are not reset because they stay sharp to the very end.

Golconda Corporation

(Division of Super-Cut, Inc.)

3218 North Knox Avenue
Chicago 41, Illinois

Leading companies who have changed to STA-SHARP for their Centerless Grinders report savings up to 50% on their diamond costs.

Send for Circular

Mail coupon for special circular giving full details and prices on STA-SHARP Diamond Tools — also Catalog of complete line of Golconda Diamond Tools for every purpose.



GOLCONDA CORPORATION
(A Division of Super-Cut, Inc.)
3218 North Knox Ave.
Chicago 41, Illinois

Gentlemen: Please send me special circular of STA-SHARP diamond tools and complete catalog of Golconda Diamond tools.

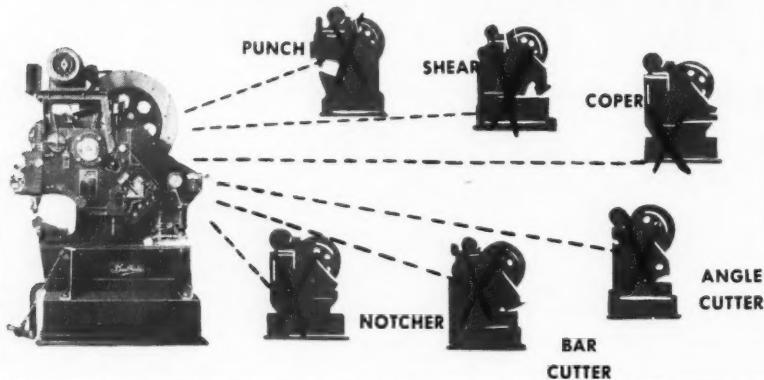
Name _____

Address _____

City _____ Zone _____ State _____

Firm Name _____

TAKES THE SPACE OF 1 MACHINE TAKES THE PLACE OF 6 MACHINES

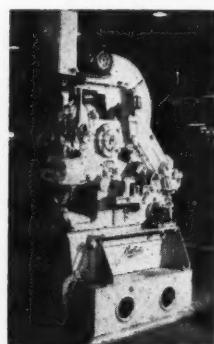


"Buffalo"

UNIVERSAL IRON WORKER

Yes, the "Buffalo" No. "0" Universal Iron Worker shown above does all these fabrication jobs. Another time-saving feature of the U. I. W. is that both shear head and punch head may be operated at the same time. These powerful, versatile machines are "breaking bottlenecks" in important industries everywhere.

At right is a "Buffalo" No. 1/2 U. I. W. in service at the Chester, Pa., plant of the *Ford Motor Company*—another example of an outstanding and efficiently operated shop. May we recommend the machine tool to cut time and cost from operation?



BUFFALO F^{ORGE} COMPANY

388 Broadway

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Buffalo, New York

DRILLING PUNCHING CUTTING SHEARING BENDING

if you do One or More of these Jobs...



CUT STRAIGHT LINES



CUT CIRCLES



JOGGLE
AND OFFSET



CUT RINGS — SMALL OR LARGE



MAKE FLANGES



CUT ODD SHAPES



BEVEL AT ANY ANGLE



CUT REVERSE CURVES



BEAD OR TURN UP



CUT INSIDE HOLES
WITHOUT CUTTING IN
FROM EDGES

*do them faster...
with more accuracy...
at a lower cost...
with **KLING**
ROTARY SHEARS*

Now get hair-line precision as well as speed, in all of your sheet and plate cutting.

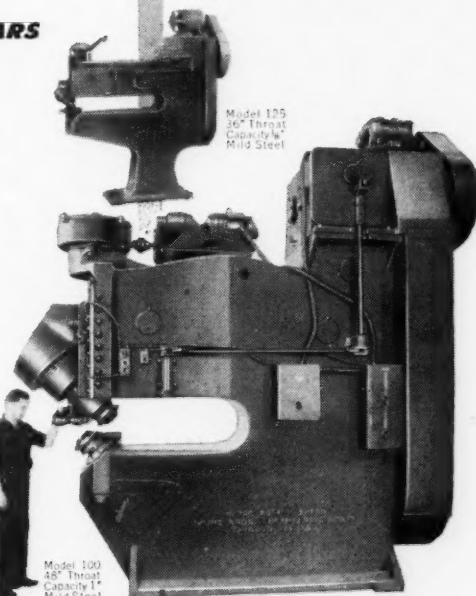
You get this money-saving performance whether you do one or many of the operations shown above. One Kling Shear, because of its versatility, will often eliminate the need of several old style shears or other types of equipment.

Many attachments are available which permit this machine to perform a wide variety of functions.

A wide range of types and sizes are available to meet your specific requirements up to a rated capacity to shear 1" thick mild steel.

Write today for your free copy of Kling Bulletin No. 245A.

Kling Bros. Engineering Works,
1328 N. Kostner Ave., Chicago 51, Illinois



Kling

...an investment in speed!





LODGE & SHIPLEY POWER and RIGIDITY
FOR THE HEAVIEST CUTS
... precision for the most exacting work!

This gigantic Model X 32" Standard Lathe, 30 feet between centers, will have vital use in the defense effort at a large California arsenal.

Whether for defense or civilian production, preference for Lodge & Shipley Lathes is easily understood. The latest in money-making and saving features are incorporated in these lathes: higher speeds, greater horsepower and all-round ruggedness permit the application of the most modern tooling.

Whether used in production, tooling or maintenance, only the most modern lathes... LODGE & SHIPLEY... can be truly profitable producers. Write for detailed literature.

THE **Lodge & Shipley**
COMPANY

MACHINE TOOL DIVISION • 3057 COLEMAN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

ENGINE, TOOLMAKER, MANUFACTURING, GAP AND OIL COUNTRY MODEL "X" LATHES, COPYMATIC, DUOMATIC and T-LATHES.

Capillarity test proves **ALUNDUM® Abrasive** makes polishing wheels last longer and perform better

Capillarity, the ability to absorb liquid, is one property of abrasives which largely determines a polishing wheel's strength and resistance to breakdown. When abrasive grain has high capillarity it is held more firmly by the glue on the wheel head — sticks on the wheel until all its work is done.

Norton ALUNDUM abrasive is specially treated to raise its capillarity — and to retain this valuable quality — assuring longer lasting, more efficient polishing wheels.

Offering many other advantages for fast, clean polishing, ALUNDUM abrasive grain is available in sizes and with surface treatments for best results on every polishing job. Write for Booklet No. 1340, "Setting Up Polishing Wheels And Belts," containing many helpful tips. Norton Company, Worcester 6, Mass. Distributors in all principal cities.



*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



LOW CAPILLARITY is shown by the way this abrasive grain sheds water. It will repel glue in the same degree, resulting in insecure adhesion of abrasive to wheel head — and short wheel life.



HIGH CAPILLARITY of Norton ALUNDUM abrasive grain soaks up every drop of water. It will soak up glue in the same way, assuring a stronger, longer lasting, faster cutting polishing wheel.



How ALLIS-CHALMERS simplifies pipe fabrication



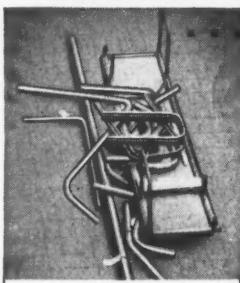
with a PINES AUTOMATIC BENDER

Cold Bending Eliminates Costly Pickling Operation

In a centralized pipe fabricating division at the Allis-Chalmers West Allis Works, a wide range of cold bending jobs for production and maintenance needs are now efficiently handled on this Pines Hydraulic Automatic Bender. The machine has ample capacity for handling requirements for pipe and tubing ranging in sizes from 3/4" thru 5". The cold bending principle of the machine, combined with push-button control and automatic operation, reduces manual effort, and cuts costs. *For example, in place of hot bending, long lengths of 3" oil line piping are now cold formed at speeds five times more efficient.* In addition, a costly cleaning and pickling operation is avoided.

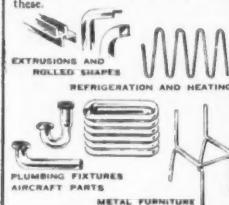
Small Lots Handled Profitably—Low Tooling Expense

Further, most small lot jobs are handled profitably. The centralized operation permits standardizing on radii of bends which lowers tooling expense. Simplicity of tooling and quick change-over features of the machine saves set-up time. The capacity and versatility of the equipment also permits handling all types of materials and shapes suitable to cold bending, such as stainless steel and chrome-moly tubing, extra heavy wall piping, channel iron, extruded and structural shapes. Thus, with modernized equipment and skillful engineering, fabricating and assembly work at A-C are greatly simplified.



View of small lot bending jobs performed on Pines Size 4 Automatic Bender. Smooth, accurate bends are formed without wrinkles or distortion.

OTHER TYPICAL PINES BENDING JOBS
There's a complete range of Pines Benders designed to profitably handle jobs like these.



PINES
ENGINEERING CO., INC.

Write FOR MORE FACTS TODAY

Find out how Pines Benders may be toolied for your work. Free catalog shows various models and tooling applications on actual jobs.



Specialists in Tube Fabricating Machinery

642 WALNUT • AURORA, ILLINOIS

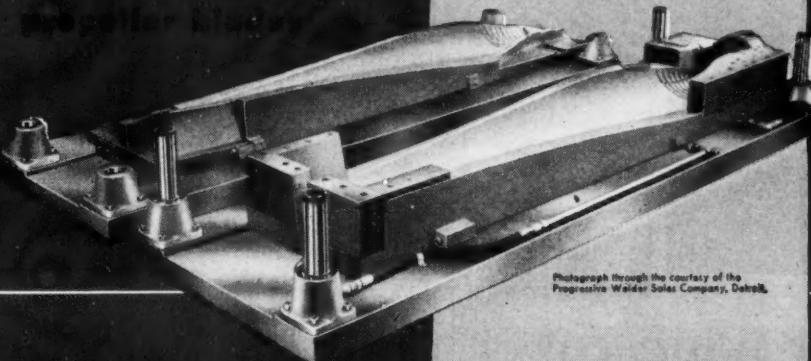
BENDING • DEBURRING • CHAMFERING • THREADING • CUT-OFF MACHINERY

HOT FORMING

This unique new process takes a previously hot-worked billet and hot forms it into a one-piece hollow steel aircraft propeller. Now, in three steps requiring only a few minutes, a superior propeller is produced that formerly required hours of work.

The development gave rise to the problem of building a special 15 ton die that would provide a quenching action from 1450 degrees in a five minute press cycle.

For a die like this, the diemakers called for ...



Photograph through the courtesy of the
Progressive Water Spars Company, Detroit.

DAMN LIVE SETS!

**CALL ON YOUR
NEAREST DANLY BRANCH
*for fast, local delivery!***

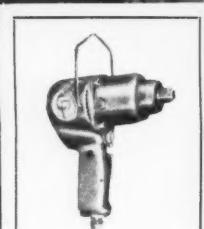
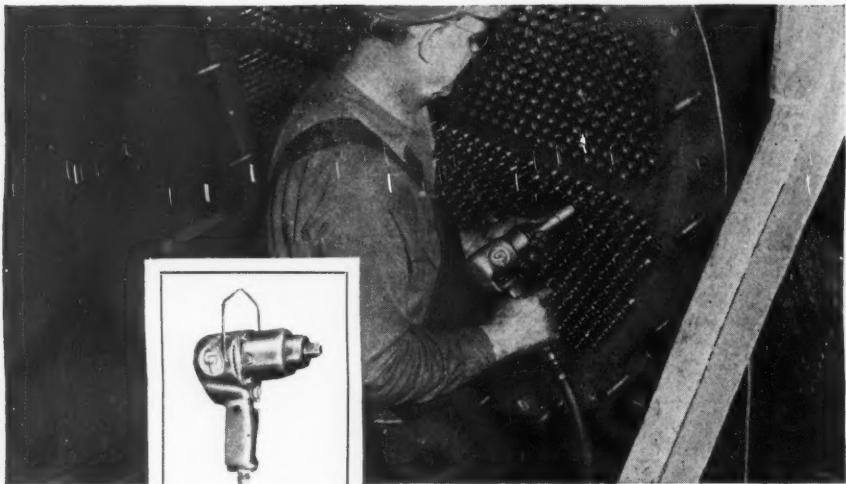
Reliable Danly precision plus unmatched facilities for the production of standard or special die sets like the one shown here make Danly Die Sets the first choice of diemakers everywhere. A nation-wide system of branch assembly plants* assures prompt, time saving service.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

PRECISION DIE SETS • STANDARD AND SP. CHA



WE ARE PLEASED TO ANNOUNCE OUR EXPANDED SERVICE TO THE STAMPING INDUSTRY



CP-3440 AIR IMPACT WRENCH

SAVING 60% OF NUT-RUNNING TIME

The packing nuts of this condenser are being run to uniform tightness because of the power regulator of the CP-3440 REVERSIBLE AIR IMPACT WRENCH. This control of tightness also adapts the CP-3440 for assembly line work anywhere.

On this particular job the CP-3440 is saving approximately 60% of the time required when a T hand wrench was used—and operator fatigue is eliminated.

Less than six inches long, the CP-3440 works where longer tools cannot be used, and weighs but 4½ pounds.

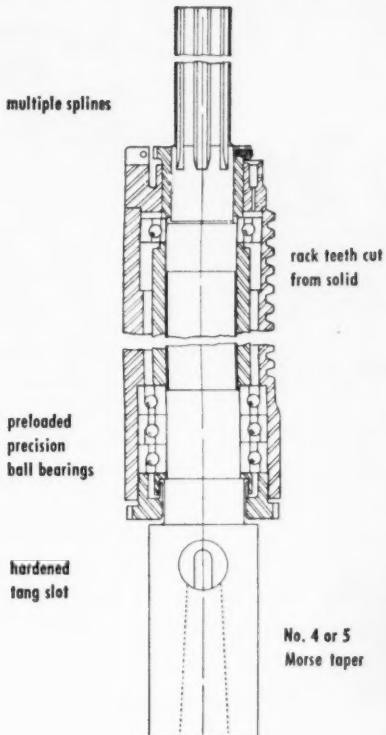
The complete line of CP AIR IMPACT WRENCHES meets every demand for tightening or removing nuts and bolts, driving and removing wood and lag screws, driving and removing studs, and for tapping, in all kinds of maintenance work. Write for Bulletin 812.



**CHICAGO PNEUMATIC
TOOL COMPANY**

General Offices: 8 East 44th Street, New York 17, N. Y.

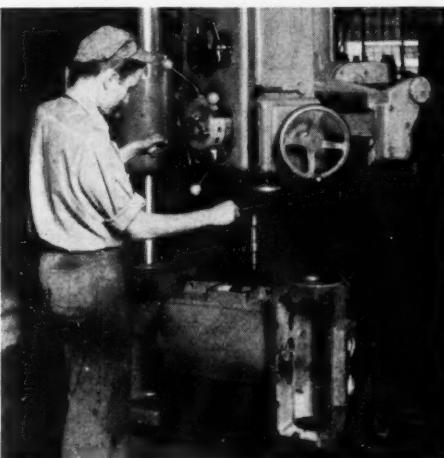
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



ACCURATE

Job after job, Cincinnati Gilbert spindles stay right on "O". The $4\frac{1}{4}$ " OD alloy steel quill has a 12" long bearing in the head; spindle is mounted in the quill with three ABEC No. 5 precision, preloaded angular contact ball bearings at the bottom and one at the top. The Gilbert spindle gives maximum accuracy even under strains of improperly sharpened drills, uneven depths of cut, as well as normal thrust load of feeding . . . For sustained accuracy, make your next radial a Cincinnati Gilbert. Write for Bulletin 349.

FLEXIBLE

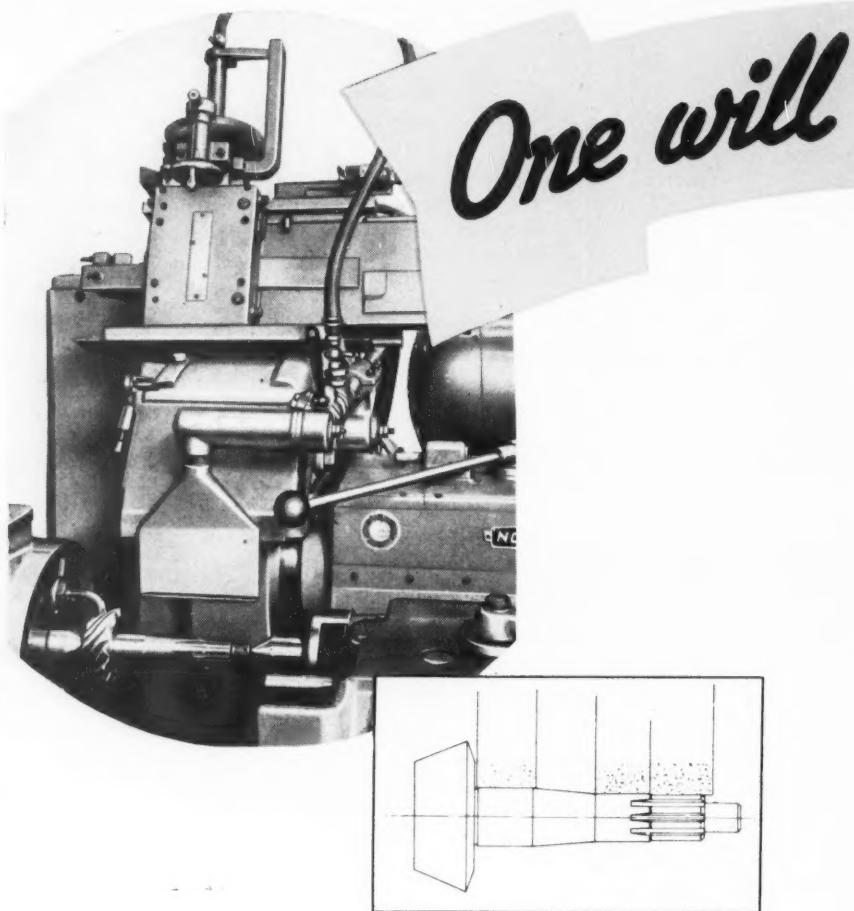


In the photo at the right the operator drills and taps a total of 35 holes, on five faces of the casting, by using a Cincinnati Gilbert Universal Table.

RADIALS
HORIZONTAL BORING MILLS
ACCESSORIES

THE CINCINNATI
GILBERT
MACHINE TOOL COMPANY
3366 BEEKMAN ST. • CINCINNATI 23, OHIO

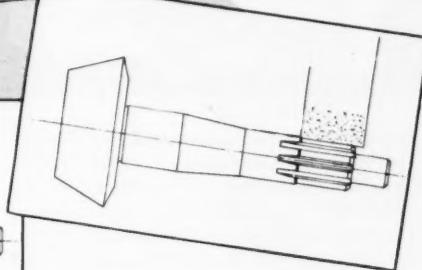
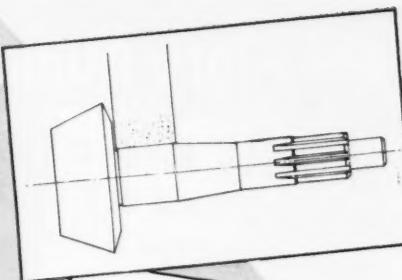
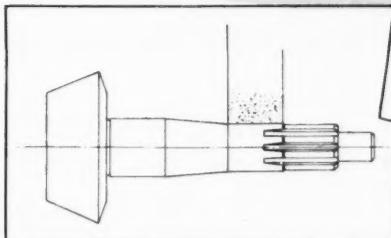
THOSE WHO BUY GILBERT BUY GILBERT AGAIN



Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASS., U. S. A.
DISTRICT SALES OFFICES: HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

get you 3



One NORTON

10" TYPE CTU SEMIAUTOMATIC

**Replaces 3 Machines . . . 3 Operations
Increases Production 128%**

The Problem: to improve the method of producing an automotive part which required grinding on three different diameters. The old method required three operations on three machines and produced only 35 parts per hour.

The Recommendation: Norton engineers suggested replacing the three old-type machines with one new Norton 10" Type CTU Semiautomatic Grinder with multi-wheel mount and automatic truing device — wheel guard type.

The Result: the new Norton Grinder accurately performs all three operations simultaneously at the rate of 80 parts per hour — a production increase of 128%!

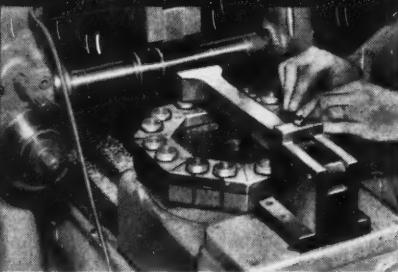
To Economize
Modernize
with a NEW

NORTON

GRINDERS and LAPPERS

Want More Milling Production?

...Simply Add a
SUNDSTRAND
Automatic
Index Base



Many methods engineers have found the Sundstrand Automatic Index Base a simple solution to increasing production. Its application to milling, boring and drilling jobs also improves accuracy and invariably makes it easier for the operator to produce more pieces per hour. Increased production and improved accuracy are both obtained while eliminating operator fatigue.

Accurate Spacing, Powerful Clamping Insures

Accuracy Unlike many conventional index bases, the Sundstrand Automatic Index Base is designed so there is no strain against the index plunger during the cut. The base is locked securely during cut by powerful clamping action applied radially. Strain against the index plunger and master plate is relieved when the base is in locked position so that accuracy of index is not affected by heavy cuts.

800 Pieces Milled Per Hr.

Here's just one of the many typical ,profitable installations of Sundstrand Automatic Index Bases. As illustrated above, this 8 station index base eliminates "down-time" on a slotting operation. Operator merely loads and unloads part during automatic cycling of machine. At each station two parts are held by an automatically operated clamp. Higher production figures like this are commonplace with the Sundstrand Automatic Index Base. It will work equally well for you.

Clamping for the cut, unclamping after the cut, indexing to each station, and stop at the completion of the desired number of indexes is all automatically controlled by limit switches. These are operated by a moving member of the machine such as a milling machine table. Thus, the operator's duties are greatly simplified permitting him to run several machines depending on operation and number of indexes.



Sundstrand
Automatic Index Base

Get Complete Data

F R E E

Ask for bulletin 513.



SUNDSTRAND MACHINE TOOL CO.

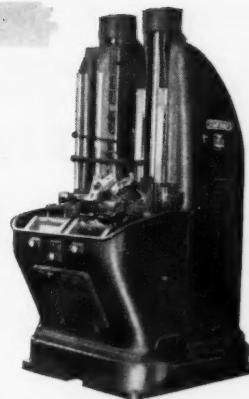
2539 ELEVENTH ST. ROCKFORD, ILLINOIS, U.S.A.

investigate

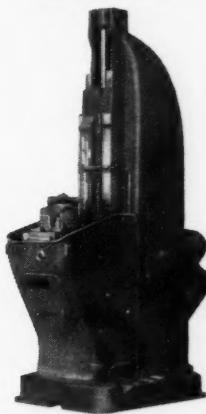
surface broaching for difficult machine work

Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Holding fixtures are designed for quick, convenient loading. Cutting tool maintenance costs are low. We will be glad to work with you on the application of surface broaching.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building



Duplex Surface Broaching Machine. Made in 5, 10,
15 and 25 Ton Sizes.



Single Slide Surface Broaching Machine. Made in
5, 10, 15 and 25 Ton Sizes.



Continuous Type Broaching Machine. Made in 4 Sizes.

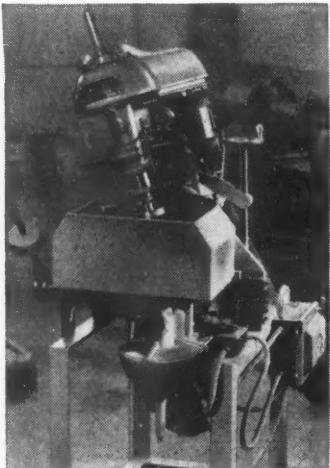
FOOTBURT surface broaching

... a time tested line of machine tools

Reduce setup and
machining time with

WALKER-TURNER DRILL HEADS

Designed to operate in any position

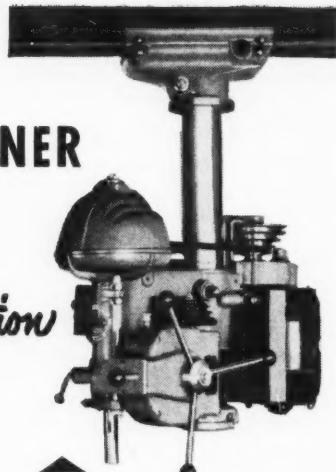


Your Walker-Turner Distributor will be glad to demonstrate the flexibility of these production tools. Let him show you how Walker-Turner 15" and 20" Drills are designed to increase production — *in more ways than one!*

SOLD ONLY THROUGH AUTHORIZED DEALERS

WALKER-TURNER
walker
• DIVISION •
Turner
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS • BELT and DISC SURFACERS
METAL-CUTTING BAND SAWS • METAL-SPINNING LATHES • SPINDLE SHAPERS • JOINTERS



Overhead Drill Press Assembly — 20" Walker-Turner Drill Head is mounted on a sliding carriage. Ball bearings provide easy lateral movement. Head swings in a complete circle.

Multiple Mounting — "In-line" arrangement of 20" Drill Presses can speed output on jobs where series of holes are to be drilled, tapped, reamed or counter-bored in a single piece.

Two Drill Heads Working at Once — to rough grind lens blanks to specified curvature. Not only is machining time reduced, but duplicate operation insures required accuracy.



Versatile BLISS Hydraulic allows unusual metal design

A new 600-ton Bliss double-action hydraulic press enables Carrier Corporation to produce the smooth-looking, but hard-to-make contours for its extensive line of air conditioners.

"By varying ram, blankholder, and cushion pressures and the draw cycle, we have been able to complete difficult drawing operations with sharp corners and small radii at the bottom. The press' flexibility also enabled us to use, more successfully than ever before, steel sheets which remained in stock for a long period, some showing evidence of open grain structure. Actually the press has exceeded our expectations," reports George R. Auld, Carrier's Vice President of Manufacturing.

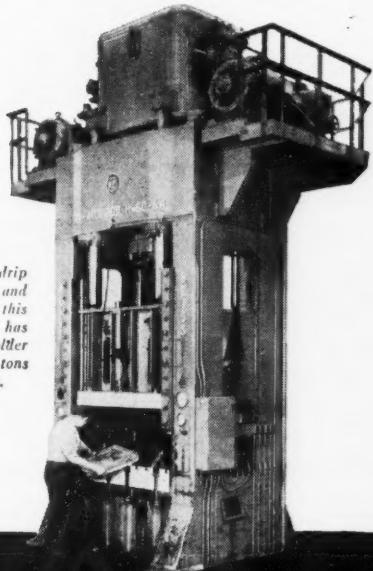
The press has been operated continuously on a 24-hour basis at maximum speed—*without missing a stroke*. No adjustment or maintenance attention was necessary. "At no time has the press ever been down due to its own inability to operate," says Mr. Auld.

This is another "live" example of what Bliss engineers mean when they promise "the right press for a given job." It's your guarantee of equipment precisely suited to your requirements, whether it's a single press—mechanical or hydraulic—or a complete stamping plant.

E. W. BLISS COMPANY, CANTON, OHIO

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

1,200 14-gauge drip pans are drawn and formed daily in this Bliss press which has 200 tons blankholder pressure and 400 tons plunger capacity.

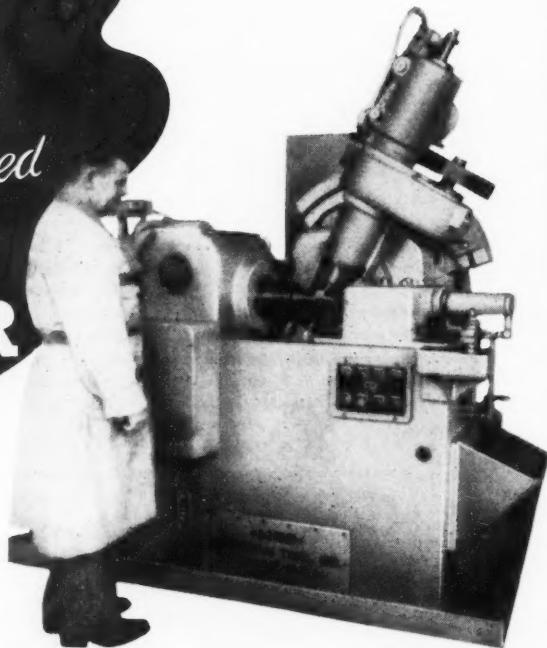


From a single press for a given job...to a complete press room...

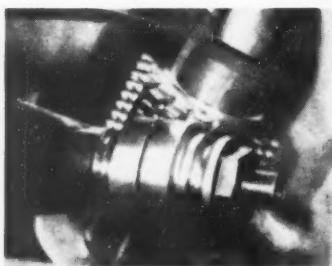
It's Bliss

Announcing the new

MICHIGAN
*High Production
High Speed*
**GEAR
HOBBER**

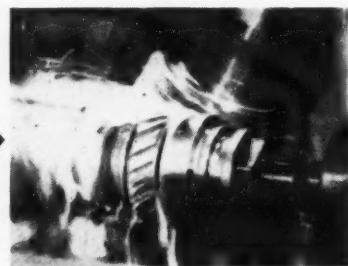


READY TO HOB TWO 3 1/4" GEARS



Just before button is pushed
to start the cycle.

15 SECONDS LATER



Hob has completed its plunge cut
and transverse feed of work starts.

Rounding out its complete line of gear production machines and tools, Michigan Tool is proud to announce successful completion of development and production testing of its spectacular new high-speed, high-production, single-spindle gear hobber—designed to make tomorrow's gear hobber requirements available today.

It employs a number of new design and operating principles developed and proven over a period of several years, all of which combine to give the Michigan Gear Hobber output rates which closely approach those of Michigan Underpass gear finishers and "Shear Speed" gear shapers.

For example, the Michigan Gear Hobber can finish-cut two $3\frac{1}{8}$ " diam. 9 pitch, (2 inch total face width) gears simultaneously to well within pre-shave tolerances, in a matter of 58 seconds, using high speed steel hobs.

For details, write for
Announcement Bulletin No. 1458A.

- Enables use of HSS hobs at practically "carbide" speeds.

- Hob speeds up to 1000 rpm or more available, if ever needed. (i. e., 1300 SFPM or more with a 5" hob)

- Infinitely variable feeds at touch of a dial.

- Gear accuracy virtually independent of machine operation.

- Positive hydraulic dual feeds eliminate 2/3 of gears otherwise required.

- Plunge feed replaces conventional approach feed; gives shorter total hob travel.

- Torsional deflection and vibration eliminated, to all practical purposes.

- Designed for push-button pre-selective hob shifting and automatic loading (optional equipment).

- Quick positive setup, almost foolproof operation; high versatility.

- One operator can easily run two or more machines despite high output rate.

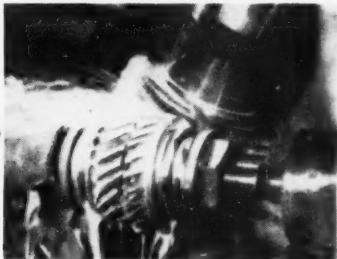
- Conforms to all JIC standards.

- Rigid and compact.



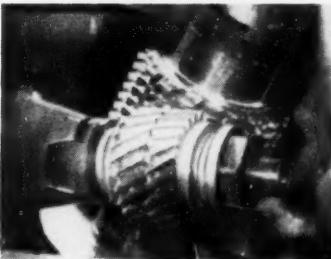
7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U.S.A.

... AT 37 SECONDS



Nearing the end of the climb cut.

FINISHED! IN 58 SECONDS

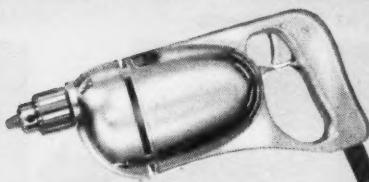


Ready for reloading.

"WE USE **SKIL** DRILLS IN MULTIPLE MOUNT

Now one operation replaces four..."

says N. Y. Starke, President
Namor Products, Inc., Cleveland, Ohio
Manufacturers of the Namor dinette line.



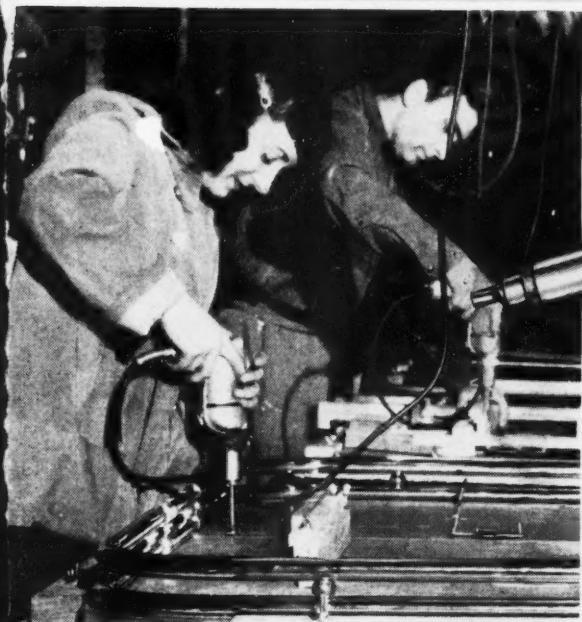
SKIL Drill—Model 241—One of 26 SKIL Models— $\frac{1}{4}$ " special duty drill. Capacity: 0" to $\frac{1}{4}$ " in steel; 0" to $\frac{1}{2}$ " in hardwood. Speed: 2250 r.p.m. no-load. Over-all length: 11 $\frac{1}{4}$ ". Weight: 4 $\frac{3}{4}$ pounds.

SKIL Bench Stands quickly convert any SKIL Drill into a stationary drill press.

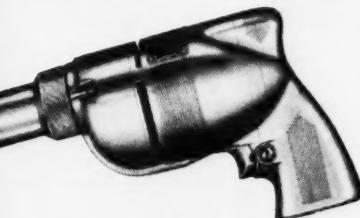
"We drill three and four dowel holes at one time with seven Model 241 SKIL Drills," says Mr. Starke. "Singly or in multiples, these dependable drills bore more than 600 holes every day. The operator now does one operation in place of three or four. This is a great saving to us in time and money."

SKIL Drills and SKIL Drivers prove themselves all along the production line

of Namor Products, Inc., manufacturers of dinette furniture. SKIL Tools have been on this job for more than two and a half years, working continuously day after day with dependable performance. These hard-working tools have required little maintenance and the cost of that maintenance has been remarkably low. That's why Mr. Starke says, "We enthusiastically endorse SKIL Tools."



SKIL Drivers—12 of them—speed assembly on this job, give Namor Products, Inc., top production with "rock bottom" maintenance costs.



SKIL Driver—Model 303—One of 20 SKIL Models—Capacity: $\frac{1}{4}$ " diameter machine screws, nuts; No. 12 self-tapping screws. Speed: 750 r.p.m. no-load, standard; speeds of 1000 and 1250 r.p.m. at no extra cost. Over-all length: 11 $\frac{1}{8}$ ". Weight: 3 $\frac{3}{4}$ pounds.

Model 489—Similar to Model 303 but with reversing switch.

See your SKIL Distributor for demonstrations and complete information.

SKIL Products are made only by SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Ill.

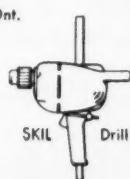
SKILSAW Factory Branches in Principal Cities
In Canada: Skiltools, Ltd.
3601 Dundas Street West, Toronto 9, Ont.



SKIL Saw



SKIL Belt Sander



SKIL Drill

SKIL
PORTABLE TOOLS



SKIL Grinder



SKIL Driver



MOLDISCS

SAVE HOURS AND DOLLARS
FEWER DISC CHANGES

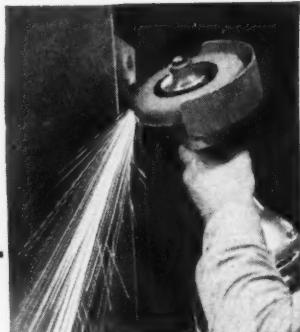


MANHATTAN ABRASIVE WHEELS



PORTABLE WHEELS

MORE METAL REMOVED
PER MAN-HOUR



Manhattan Moldisces have out-moded coated abrasive discs on many tough, rough finishing jobs. The abrasive is bonded throughout the Moldisc, providing $\frac{1}{4}$ " thickness of effective grinding in the standard 7" x $\frac{1}{4}$ " x $\frac{7}{8}$ " disc.

Manhattan Abrasive Wheels for portable grinders are engineered for the job. They satisfy workers on incentive pay who want high grinding speeds. They satisfy management men who want good quality production and lower costs.



WRITE TO ABRASIVE WHEEL DEPARTMENT



MANHATTAN RUBBER DIVISION

RAYBESTOS-MANHATTAN, INC. • PASSAIC, N. J.

Mechanical Rubber Products • Rubber Covered Equipment • Abrasive and Diamond Wheels • Packings • Brake Linings • Brake Blocks • Clutch Facings • Radiator Hose Fan Belts • Asbestos Textiles • Powdered Metal Products • Bowling Balls

Choose: PRACTICAL PRODUCTION SIZE and WIDE JOB FLEXIBILITY



The Rockford Economy Lathe is of sufficiently heavy construction to stand up under general production and maintenance use, while providing the accuracy needed for the tool room. Its dimensions are ample. High quality materials are used liberally and judiciously.

- When you check the Rockford Economy Lathe, you'll see how highly qualified Rockford engineers have combined quality materials, modern machine tool design, and precision workmanship to provide a better Lathe in the medium price range for general production, maintenance and tool room work.

A Rockford representative will give you full details, or send for Bulletin No. 900C.

Buy THE MOST LATHE
FOR MORE WORK

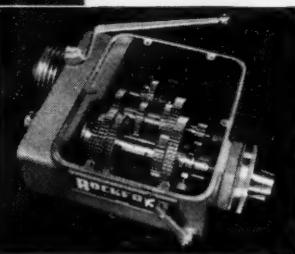
MEDIUM-SIZED
ECONOMY-PRICED

ROCKFORD ECONOMY LATHES - 16" and 18"

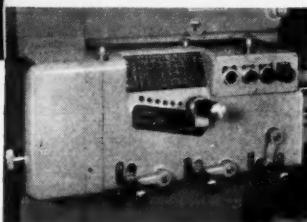
518

ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS

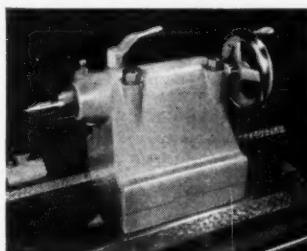
October, 1951



All headstock gears are cut from individual preheat treated steel forgings, annealed to the hardest machinable state and hobbed and shaved to provide smooth, quiet operation.



The quick change gear is designed to provide a full range of commonly used threads from 4 to 56 per inch and carriage feeds from .004" to .060" per revolution of spindle.



The heavily constructed tail-stock is equipped with anti-friction, thrust bearings for ease of operation.

Under the



**TYPICAL HELP FOR PLANTS
SWITCHING TO
DEFENSE PRODUCTION**

Machining:

- Shells
- Mortars
- Medium Calibre Guns
- Small Arms
- Armor-piercing Shot
- Rocket Launchers
- Jet Engine Parts
- Bullet Cores
- Cartridge Cases

Heat Treating:

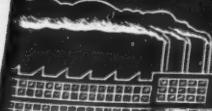
- Rocket Motor Bodies
- Bazooka Motor Bodies
- High Explosive Shells
- Steel for Aircraft

Forging Metal Metal

Cleaning and Preparing Metals to
meet Government Specs.

**DEFENSE
PRODUCTION
DATA**

FROM...



**The
HOUGHTON
LINE**

A factual record of heat
treating and metal-working
experience in processing
**SHELLS • CANNON • SMALL
ARMS • AMMUNITION
• ROCKETS**

Houghton man's hat there's help for you...

• Getting out into the shop as Houghton men are invited to do, they meet up with a whale of a lot of metalworking problems.

They're continually called on for help in solving problems like these: meeting high physicals in the heat treatment of "lean alloy" steels . . . boosting machine output and reducing rejects . . . developing lubrication that stands up under all operating temperatures . . . cleaning metals faster at lower cost . . . preventing idle equipment from rusting . . . deep drawing safely at extreme pressures . . . and so on.

By working on such a wide variety of problems Houghton has accumulated a lot of metalworking "know-how". We keep careful tabs on success stories through research data and field reports. And all of this information is constantly studied to find out how it can be more widely applied to help the whole metalworking industry.

Because of this vast metalworking experience Houghton men are called on repeatedly for aid—particularly by plants faced with unfamiliar conversion problems. Two-thirds of our sales and research organization today, are veterans

of World War II production experience.

Now another rearmament program is getting into full swing. Changes on the production line are popping up again. And Houghton men are busy helping customers lick today's problems.

Your Houghton man can help you with many of your problems right on the spot. He can also draw on the wealth of production data our research staff has at its fingertips. For example, the list at the left shows some typical help we can offer on defense production today.

Meantime, to make some of our extensive experience immediately available to you, we have put it into quick reference form. Called "Houghton Defense Production Data", this 60-page illustrated book provides you with information that may save endless hours of searching—and costly trial-and-error experimenting.

Get timely help with your conversion problems by sending today for your copy of this valuable book. Fill out and mail the coupon to E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Pa.



Ready to give you
on-the-job service . . .



E. F. Houghton & Co.
303 West Lehigh Avenue, Philadelphia 33, Pa.

Please send us a free copy of the new 60-page book,
"Houghton Defense Production Data"



Name _____ Title _____

Company _____

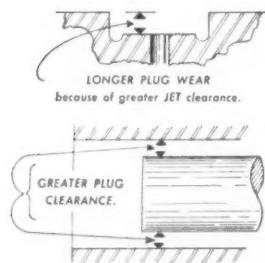
Address _____

City _____ Zone _____ State _____

LET'S GET IT STRAIGHT!

The "DIMENSIONAIR" Air Gage —

EACH GRADUATION IS .00005"
AND NO DOUBT ABOUT IT.



ACTUAL SIZE: 9" x 7½" x 8½"
WEIGHT 17½ LBS.

FEDERAL

Largest manufacturer devoted exclusively to designing and
manufacturing all types of DIMENSIONAL INDICATING GAGES

IS calibrated accurately over its entire range

IS set accurately with only one master

HAS a range of .003" with 2500 to 1 magnification

HAS much longer plug wear

HAS greater plug clearance so that the same plug can
be used on both rough and finished dimension

REMAINS stable for long periods of time

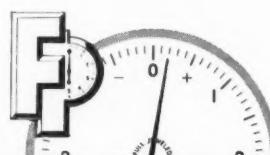
YES, LET'S GET IT STRAIGHT, the Dimensionair uses its own operating principle and new mechanical devices which do away with the limitations common to previous types of air gages.

FEDERAL DIMENSIONAIR PROVES ITSELF

Why not find out to your own satisfaction what the Federal Dimensionair will do for you! Put it to work—discover how the exceptional measuring range of .003" lets you gage irregular shaped and tapered holes. Oil or coolants won't affect the Dimensionair: grit and dirt won't clog it: rough handling won't harm it.

Find out how the Dimensionair can do all this and more—ask our nearest representative to show you the Federal way to better, more positive air gaging, or write to us for complete information and prices.

FEDERAL PRODUCTS CORPORATION, 1410 Eddy Street, Providence 1, Rhode Island.



The Soft Rubber Binder CUSHIONS The Abrasive

What Does RUBBER Do To Speed Up Your Light-Finishing Operations?

You'd be surprised! Rubber-cushioned Brightboy abrasives have created an entirely new and wider concept of time-saving finishing of *lightweight and semi-precious metals, plastics, laminated materials, wood, glass—and maintenance of machinery, tools, dies, and mechanical equipment.*

The abrasive is completely and uniformly dispersed throughout the rubber binder which gently retards, cushions, controls, the light-grinding action. Rubber and abrasive work together, simultaneously, in burring, cleaning, finishing, and polishing in one operation. Time savings, compared to conventional one-by-one burring, cleaning, finishing and polishing steps frequently amount to as much as fifty per cent.

In a single operation Brightboy can bridge the gap between the rough grind and the buff. It works to close tolerances and can be shaped to curved surfaces and contours. It produces a wide variety of conventional and special surfaces—damaskeening, for example—the surface effect being achieved by speed and/or pressure of the Brightboy wheel, stick, rod, or block. And frequently the final polish. Requires no before-use dressing or preparation; no skilled labor to handle it. General uses include removing light digs—tool and heat marks, cleaning welded and soldered joints, finishing dies and molds, burring and finishing stampings, castings, machined and molded parts.

Ask your dealer about Brightboy—and for the Brightboy Catalog Manual containing work data and time-saving suggestions. Write the Brightboy Service Department on any problems where light finishing and precision surfacing methods and production are involved.

BRIGHTBOY INDUSTRIAL DIVISION

WELDON ROBERTS RUBBER CO.

6th Ave. & No. 13th St., Newark 7, N. J.
America's Pioneer Manufacturers of
Rubber-Bonded Abrasives



WHEELS, STICKS,
RODS, BLOCKS
for machine and
manual operations



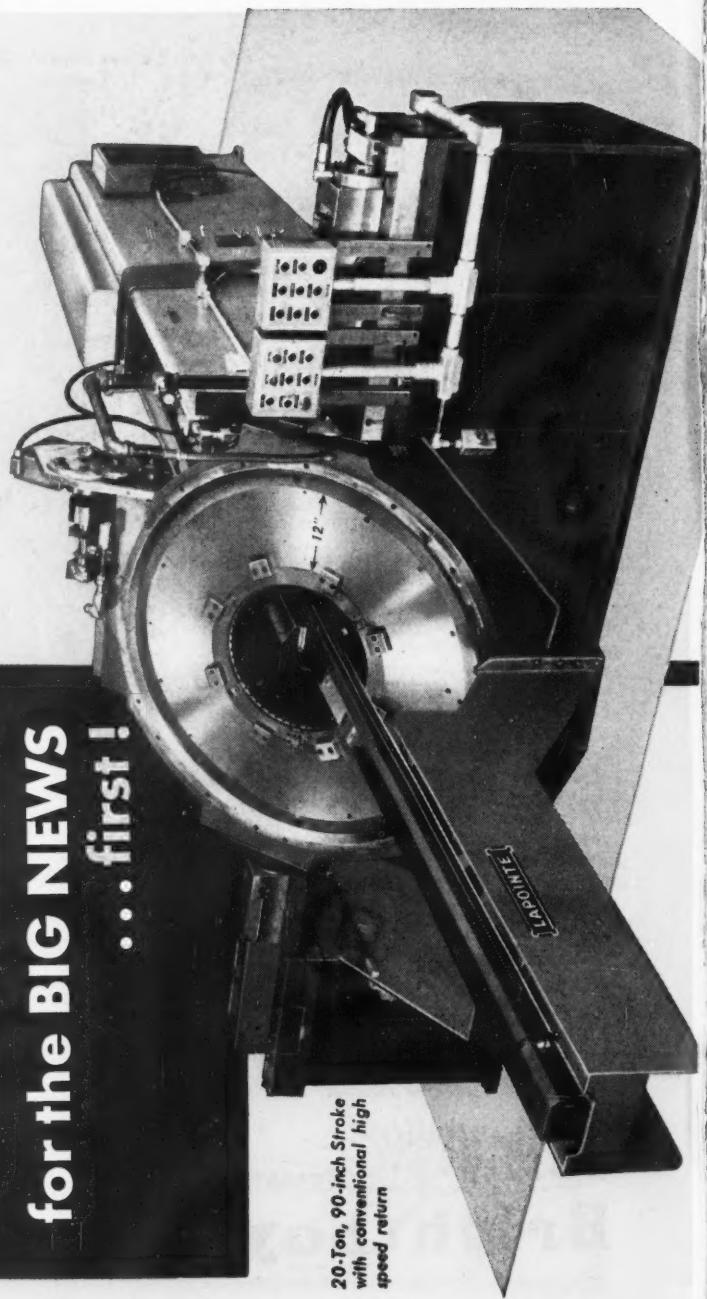
**BRIGHTBOY IS ALREADY-PROVED FOR
DEFENSE-PRODUCTS MANUFACTURE
AND MAINTENANCE**
Ordnance
Internal Combustion and Jet Engines
Airplane Parts
Electrical and Electronic Equipment
Transportation Equipment
Instruments
and for the production of basic tools,
dies, molds, jigs, patterns, etc.

Look to

LAPONTE

**for the BIG NEWS
... first!**

The straight-line, horizontal pull is the most efficient, most accurate broaching method for cutting slots in stator rings for use in locomotive gas turbine engines or stationary power plants.



**20-Ton, 90-inch Stroke
with conventional high
speed return**

FOR EXAMPLE

this **LAPOLINTE**

H-P 40 SPECIAL

HORIZONTAL BROACHING MACHINE

has a LAPOLINTE-ENGINEERED
fixture that will accommodate all sizes of
STATOR RINGS from 30" to 48" in diameter!

Built with adjustable travel of 15", hydraulic index, hydraulic plunger and fully automatic lubrication, this fixture makes possible the precision broaching of 40 to 100 slots in stator rings at the high production speed of 35 seconds per slot!

What's your broaching problem?

Lapointe can give you the *right answer*, for Lapointe has the experience, the plant, the personnel to engineer your *entire broaching job*: machines, tools, and fixtures. You are always safe, when you *leave it to LAPOLINTE!*

The Lapointe

MACHINE TOOL COMPANY

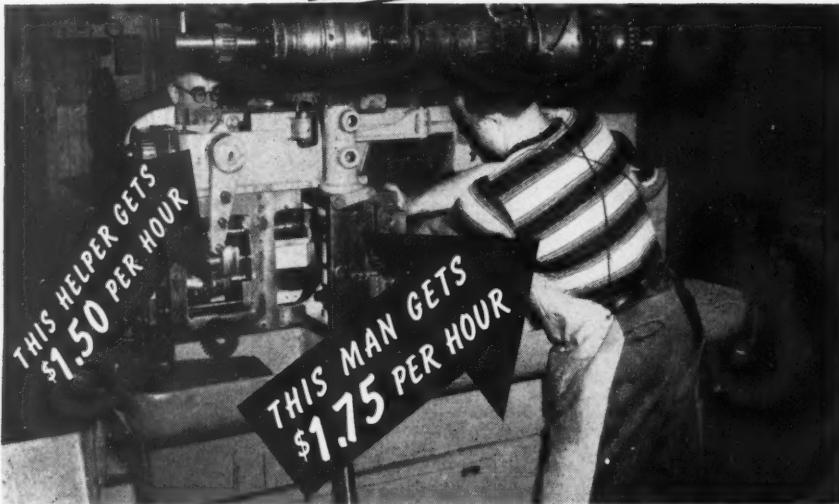
HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

Write for illustrated technical
Bulletin HP-8

MASSACHUSETTS
LAPOLINTE
MADE.

DON'T BE PENNY WISE and DOLLAR FOOLISH WHEN IT COMES TO GEARS



Down time (for disassembly, gear replacement, reassembly) —
4 hrs. minimum.....

\$13.00

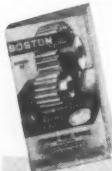
Loss of 4 hrs. profit and overhead on this job

\$48.00

Sixty dollars lost because they "saved" ten per cent on a \$10.00 pair of gears by buying inferior gears that quickly wore out and had to be replaced by BOSTON Gears

NET LOSS

\$60.00



For information and prices on over 2000 types and sizes, contact your Boston Gear Catalog No. 55. Free copy on request.



Standardize on Stock Boston Gears Design them into your equipment Always specify them for replacements
Stocks at 80 Authorized Boston Gear Distributors—
one near you

BOSTON Gear stocks are Near



BOSTON GEAR WORKS

68 HAYWARD ST., QUINCY 71, MASS.



Spur Gears



Bevel Gears



Worm Gears



Helical Gears



Sprockets and Chain



Belts and Chains



Universal Joints



Bearings



Couplings

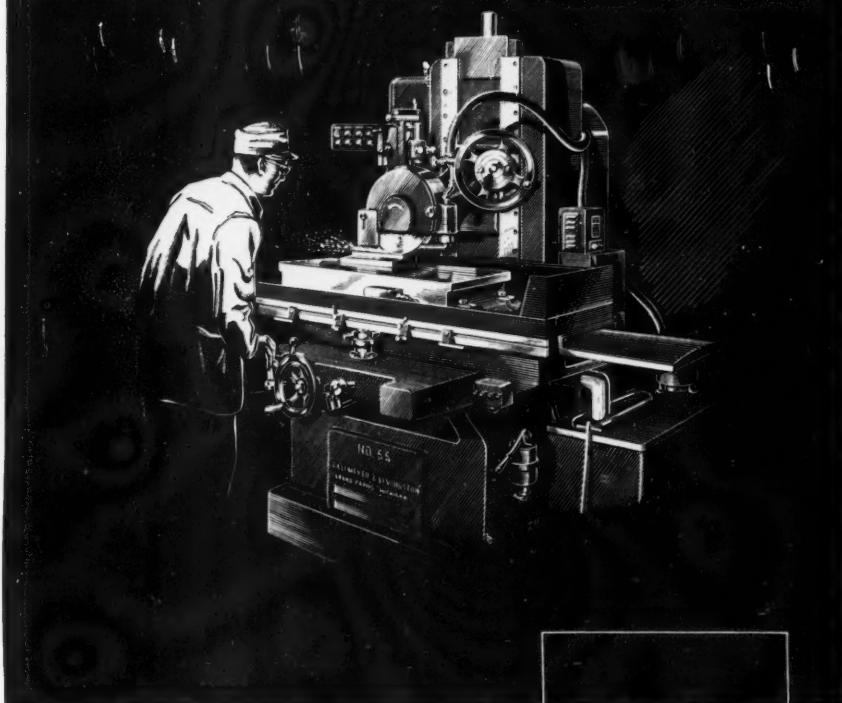


Bushings



Pillow Blocks

WHEN THE DECISION IS PRECISION...



Where extreme tolerances are not required, the choice of any particular grinding machine may not be too important. But, where absolute precision is demanded, the choice is usually *Grand Rapids*.

Defense orders make it impossible to fill orders as quickly as we desire—but we know our customers can appreciate the reasons for delay. As always we'll do our best to serve you.

GALLMEYER & LIVINGSTON CO.
308 Straight Ave., Grand Rapids, Mich.

Grand Rapids Grinders

—World's finest



**GALLMEYER
& LIVINGSTON**

TOOLING UP FOR ORDNANCE WORK?

- Investigate the tool holder developed to utilize the full inherent capabilities of carbide.



VIKING V-BACK TURNING TOOLS

V-BACK TOOL BITS

Serrations on bottom of tip and corresponding serrations on locking wedge combined with broached holder, provides positive tip anchorage under all types of cuts. V-Back method of tool bit design provides equivalent tool life and performance of large tip with considerably smaller tip.

Quick removal and replacement of dull tool bits without removal of tool holder.

Economical reconditioning of dull tool bits. Tips are ground only on the wear surfaces. Heavy dull lands are removed with minimum waste of carbide.

Holders supplied in shank sizes from $\frac{3}{4}$ " to 2." Straight turning, 20 degree lead angle, offset and facing tools.

Also . . . Manufacturers of Inserted Blade Milling Cutters

ON THE JOB ADJUSTABLE CHIP BREAKER

"On the job" adjustment of chip breaker to control the chip to meet variations in speeds, feeds, depth of cuts, and material machined.

Carbide to carbide contact of chip breaker block and tool bit allows no wedging of chip under breaker to fracture the carbide.

Chip breaker block and tool tip simultaneously locked in tool holder with one locking device.

Solid carbide block provides trouble free, long life chip breaker. No chip breaker grooves to grind into the tip each time tool is sharpened.

VIKING TOOL COMPANY SHELTON,
CONN.



REASON

Keeness of Teeth Maintained!

The Nicholson File Company in Providence, R. I., tell us that the SENTRY DIAMOND BLOCK METHOD of heat treating their high speed rotary power tools (hand cut or precision ground) permits them to do a top quality job and to fully maintain pre-cut keenness of teeth. Further, SENTRY gives Nicholson the right heat treating answers on an almost endless variety of sizes and shapes of rotary power and other tools.

Ask for Catalog E-5

See you at the National Metal Exposition and Congress in Detroit!

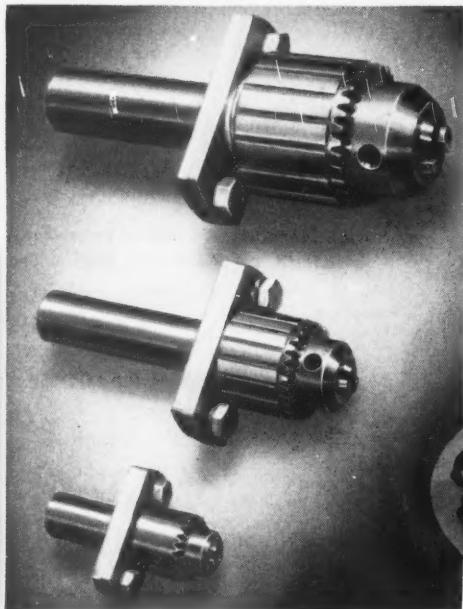
We'll be looking for you at Booth No. A-109.

See actual Sentry Furnace in operation. Bring samples to be hardened on the spot!

Don't forget the date—October 15-19, 1951



BARNABY FLOATING HOLDERS



Patent No. 2497426

Barnaby Chuck-Type Floating Holders assure perfect alignment of drills, reamers, counterbores and similar tools. They offer new convenience in setting up automatics and turret lathes, and are particularly valuable on short-run work in cutting tool-change time to a minimum.

These sturdy high-precision tools consist of two parts: (1) the shank, with integral flange; and (2) a similar flange on which the 3-jawed chuck is mounted. Floating construction permits perfect alignment of tools with the work. Available in 7 capacities, with $\frac{5}{8}$ ", $\frac{3}{4}$ " and 1" shank diameters.

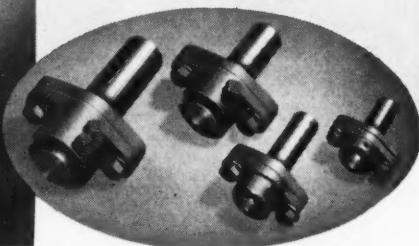
◀ Chuck Type

FOR FAST TOOL CHANGE

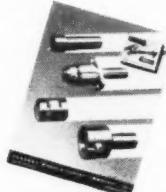
and

PERFECT TOOL ALIGNMENT

or Conventional



These all-steel precision Floating Holders of conventional design are recommended for use where the quick-change feature of the Chuck-Type Holders is not required. Furnished in shank diameters of $\frac{5}{8}$ ", $\frac{3}{4}$ ", 1" and 1 $\frac{1}{4}$ ".



Write for this bulletin which gives full information on these and other Barnaby tools. No obligation, of course.

Barnaby MANUFACTURING CO., INC.
70 KNOWLTON ST., BRIDGEPORT 8, CONN.

Be Sharp KEEP YOUR PLANT'S TOOLS SHARP

With OLIVER ACE Universal Tool and Cutter Grinders

You'll find no problems in keeping difficult cutters sharp if you equip your toolroom with OLIVER ACE Universal Tool and Cutter Grinders. They excel on high speed and Tungsten-Carbide work and easily grind cutters of all types. Proven and dependable, OLIVER ACES give guaranteed accuracy — they're designed and built for it.

OLIVER Grinders reduce fatigue. Their direct reading for clearances eases the operator's job (no stoop . . . no squat . . . no squint). Faster on most grinding operations, the ACE is easy to operate — simple to set-up. BE WISE, OLIVERize.

Priced to meet your budget, the ACE excels for grinding face mills up to 15" — also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing.



2 MODELS: Standard and Heavy Duty (illustrated).

Write For Illustrated ACE Catalog

OLIVER INSTRUMENT CO.

1430 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL
POINT THINNERS—TEMPLATE
TOOL GRINDERS—FACE MILL
GRINDERS—DIMAKING MACHINES

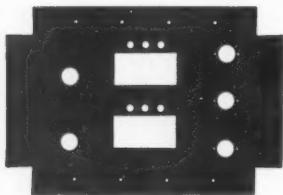
STOP! the high cost of
piercing sheet metal in quantities
of 1-5-10-50-100 or 200 pieces
of a kind.

COMPARE!

the Wiedemann R-4IP with your
best times on jobs similar to those
below on sheets up to 26" x 48".

TIMES! shown include
set-up.

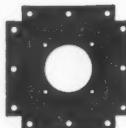
INVESTIGATE the WIEDEMANN METHOD



First piece 9.5 minutes
Additional pieces
2.75 minutes each
Includes all set up



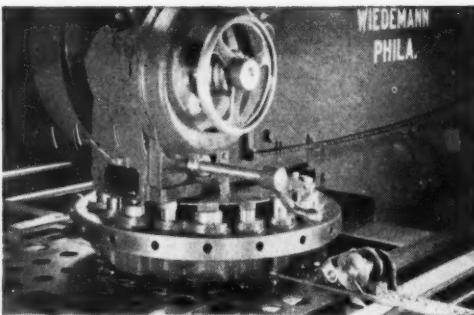
First piece 3.75 minutes
Additional pieces
.90 minutes each
Includes all set up



First piece 2.40 minutes
Additional pieces
1.05 minutes each
Includes all set up

Do You Produce Templates?

The Wiedemann R-43 Micro-Turret Punch Press produces templates with holes accurate to $\pm .002"$ at unparalleled high speed. Write for details.



R-4IP Wiedemann Turret Punch Press

**Here's how you can pierce short
run work at such great savings**

SAVE on Tool Set-up

- ★ 18 punches and dies set-up for instant use
- ★ Install tools in turrets in less than one minute
- ★ Tool cost is always low

SAVE with UNMATCHED FLEXIBILITY and SPEED in ACCURATELY LOCATING HOLES

- ★ Gauges are set-up from drawing dimensions, charts, or templates
- ★ Gauges locate from one corner of the material
- ★ Center punched layout or pilot holes
- ★ Back gauge bar is handwheel operated
- ★ Cross stops are positive
- ★ Both motions are provided with direct reading scales or dials

THE R-4IP TURRET PRESS PIERCES . . .

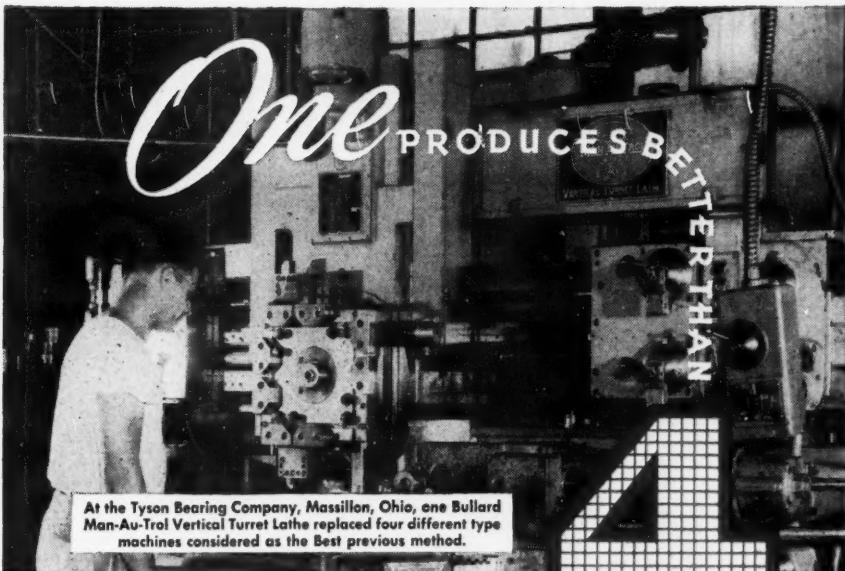
- ★ Round holes to $3\frac{1}{8}"$ dia.; square holes to $2\frac{1}{4}" \times 2\frac{1}{4}"$; round end slots to $3\frac{1}{8}"$ long.
- ★ Odd shaped and grouped holes
- ★ Knockouts, dimpling, corner and edge notches, radius corners, small louvers
- ★ Special corner development cutouts
- ★ Large rectangular, square, or L shaped openings

THE WIEDEMANN METHOD IS THE ONLY LOGICAL SOLUTION TO THE SHORT RUN PIERCING PROBLEM

Send Drawings for Time Study

WIEDEMANN MACHINE COMPANY

4219 Wissahickon Avenue • Philadelphia 32, Pennsylvania



At the Tyson Bearing Company, Massillon, Ohio, one Bullard Man-Au-Trol Vertical Turret Lathe replaced four different type machines considered as the Best previous method.

The Tyson operator says, "It takes no time to get set, less than most other machines I've worked on. We can cut anything that we can hold on this machine. We have never found the limit of how much we can cut—if it's a rugged piece, she sure gets a good bite."

Another statement in this plant illustrates the utility value of Man-Au-Trol V.T.L. "Most of our work is short runs—from 2 to 16 hours for one part. Only occasionally do we run as much as five days on the same part. That's why we like the great Flexibility of Bullard Man-Au-Trol. With the former machines we set one for single purpose boring, another for the turning of cups. Man-Au-Trol does the whole job. I don't know of any machine that does as many operations with such simple tooling."

If this works for Tyson, perhaps it can be Profitable for you.

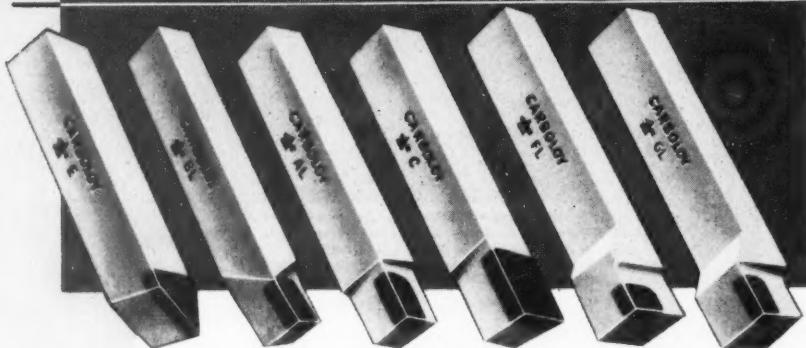
Ask a BULLARD man to survey your jobs.



THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Boost Production

with Standard Carboloy Tools...



with Carboloy Services... finer

An all-inclusive service program . . . to help you get the greatest possible benefit of performance and savings from Carboloy Cemented Carbides. Covers everything! Tool design . . . all phases of use, maintenance of carbide tools . . . practical tips on tool conservation, increased productivity.

Specific services and material include advice and assistance from skilled Carboloy engineers and technicians. A Customer Training School in Detroit for your key men (tuition-free). Slide Films (at approximate print cost) for your in-plant use. Technical Literature.

Catalogs. Manuals. Charts. Everything you need to help select, design, fabricate, use and maintain carbide tools. New technical training literature for defense production, too.

Also, to increase the all-around efficiency of carbides in your plant, the Carboloy Plan of Coordinated Carbide Control . . . the famous "Triple C" Plan adopted and proved by hundreds of manufacturers.

Write, wire or phone Carboloy organization today for information about this outstanding Carboloy Service Program. Or contact your local Carboloy Sales Engineer or Authorized Distributor.

Specify

CARBOLY
CEMENTED CARBIDE

Lower Costs...

fewer tools to do more jobs



No need to stock a heavy, costly inventory of special carbide tools... not when you use Standard Carboly Tools. Only 11 styles are needed to do 4 out of 5 of your single-point tool machining applications. Whatever the job, whatever the material, chances are that one of these versatile Standard Carboly Tools is adaptable.

Standard Carboly Tools cost less than many high-speed steel tools, too, outlast them as much as 10 to 1. Wherever they're used, production goes up, tool costs go down. And savings in tool maintenance, down-time and tool replacement really add up.

Over 14 million of these uniform high-quality Standard Carboly Tools have been setting records throughout industry. Doing tough production jobs faster, better, cheaper.

Standard Carboly Tools in the most commonly used sizes are available from your local authorized Carboly distributor. The Carboly organization is the world's oldest and largest producer of cemented carbides.

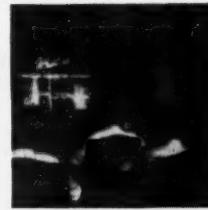
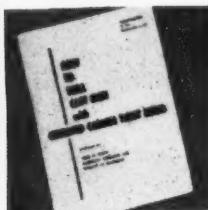
CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11143 E. 8 MILE AVE. • DETROIT 32, MICHIGAN

"Carboly" is the trademark for the products of Carboly Department of General Electric Company.

aids to extra performance



FOUR IN-PLANT CARBIDE AIDS. Part of the comprehensive Carboly Service Program (left) to help you to new highs in production and savings through most effective use of cemented carbides. Program, illustrated above, left to right, includes: (1) Technical data on how to drill Cast

Iron with Carbide Twist Drills, (2) Famous Carboly "Triple C" Plan, (3) Cemented Carbide Data for Defense Production, for shell contractors only, and (4) Slide Films for training in carbides. All services free, with exception of slide films, which are yours at approximate print cost. Write today.

STANDARD TOOLS

THE QUALITY BRAND

Standardize on **PRATT & WHITNEY REAMERS**

—they have the
**UNIFORM QUALITY,
PRECISION AND
LONG LIFE**
required to meet
Today's Critical Needs



"**THERE'S NO BETTER-PAYING INVESTMENT
THAN THE RIGHT TOOLS FOR THE JOB"**

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD I., CONNECTICUT, U.S.A.

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A new addition to the LENOX family



ARBOR SCREWS INTO
BODY OF SAW, SECURED
BY TWO DRIVE PINS

TOUGH ALLOY
STEEL BACK

ELECTRIC WELDED
HIGH SPEED
STEEL EDGE

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SEND FOR LENOX HOLE SAW
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FROM OUR LARGE
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&
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In this method

of Tool and Die Making — you Buy Less Steel and Reduce Machining Costs



Write for New Booklet:
CAST-TO-SHAPE

TOOL STEEL

Gives you full details on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties capable of saving you time and money.

FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sec-

tions can often be fabricated from FCC Cast-To-Shape blanks in a single piece. In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings. Particulars are available through Allegheny Ludlum representatives; or write for the booklet today.

• Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda and Jarvis Avenues, Detroit 20, Michigan.



For complete MODERN Tooling, call
Allegheny Ludlum
WAD 3668

**Get Your Copy—
Write for it Today
ADDRESS DEPT. MS-22.**

**engineered and built
for rugged duty!**

**LINDBERG INDUCTION
HEATING UNITS**



These Lindberg Induction Heating Units are engineered and built to fill your needs for rugged, reliable, easy to maintain equipment. Now in operation in plants throughout the country, Lindberg Induction Heating Units are giving continuous 24 hour a day operation with an absolute maximum of dependable uninterrupted production.

Available in single and two-station models—5, 10, 25 KW sizes.

- | | |
|------------------------------------|---|
| Generous Sized Cabinets | —for easy access and inspection. |
| Conditioned Cooling | —temperature controlled water cooling eliminates condensation, reduces consumption and pressure requirements. |
| Built-in "Checklites" | —indicating lamps instantly indicate abnormal operating conditions. |
| Oversized Components | —every part designed with extra strength to increase service life. |
| Filament Voltage Regulation | —operate tube filaments under ideal conditions at all times. |
| Industrial Type Tubes | —recently designed to withstand hard usage and production line conditions. |

Investigate the Lindberg Induction Heating Units—you will profit from their toughness—their ability to deliver 24 hour a day operation—day after day. Ask for Bulletin 1440.

LINDBERG  **HIGH FREQUENCY DIVISION**

Lindberg Engineering Company, 2469 W. Hubbard Street, Chicago 12, Illinois

One hour



500 lbs.

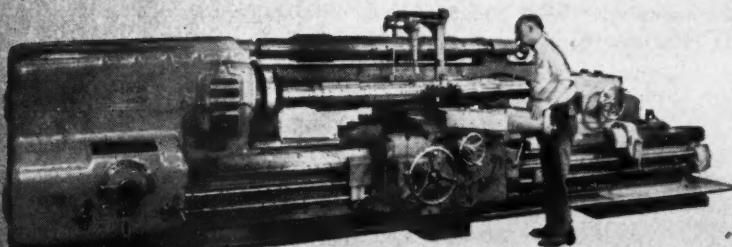
1300 lbs. - finished

One hour to finish turn this Diesel Locomotive Driving Axle from the rough forging, removing 500 pounds of chips and using 60 horse power cuts in the process.

This shows what a 25" "AMERICAN" Hydraulic Duplicating Lathe driven by a 50 H.P. motor can do. Production records of this kind are the rule rather than the exception and are being made daily.

"AMERICAN" Hydraulic Duplicating Lathes reduce machining time 50 to 75 per cent . . . cut costs to the bone . . . pay good dividends on the investment.

Repeat customers vouch for this in the most convincing way.



Bulletin No. 35
gives a complete
description and
shows many ex-
amples. It's yours
for the asking.

THE AMERICAN TOOL WORKS CO.

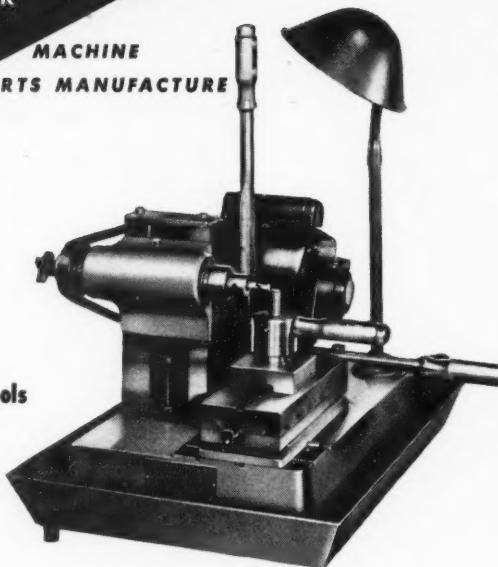
Cincinnati, Ohio U.S.A.

lathes and Radial Drills

THE NEW COMBINATION
VIKING LMG 3

LATHE
MILL
GRINDER

A BENCH-TYPE MACHINE
FOR SMALL PARTS MANUFACTURE



- ✓ Turns, Mills or Grinds
- ✓ Rapid, Easy Changeover
- ✓ Operates With Standard Tools

This combination Bench-Type Machine for Small Parts Manufacture is extremely versatile for combination operation, or in batteries on straight-line production.

Design principle involves a basic machine, spindle, drive, horizontal and vertical slides, adapted quickly to Turning, Milling or Grinding through simple tooling changes. Standard 1" ball-bearing spindle has speeds of 825 and 3450 rpm., with optional range from 100 to 7000 rpm. Coolant system available if desired.



WRITE for Complete Description
In our New Bulletin No. 300.

VIKING INDUSTRIES
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BETTER TOOL GRINDING

MEANS LOWER PRODUCTION COSTS

**SELLERS
4-T TOOL
GRINDER**

FULL
INFORMATION
UPON
REQUEST

Grinds any carbide
or high speed steel,
straight or curved,
faced tool from $\frac{1}{4}$ "
square up to $1\frac{1}{2} \times 2"$

Among Heavy Machine
Tools built by
Consolidated are . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND
MILLING MACHINES
DRILL AND TOOL
GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

The grinding precision and uniformity of Sellers Tool Grinders are the result of the Sellers Line Contact Principle of grinding, accomplished by moving the work up and down in a straight line tangent to the periphery of the grinding wheel, in this way allowing the work to contact the wheel along a line only. Proper rake and clearance angles at the cutting edge are quickly and economically obtained. The operation is so simple that a tool-room attendant can easily maintain tools for the entire shop.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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**CONSOLIDATED
MACHINE TOOL CORPORATION**

ROCHESTER 10, NEW YORK



PATENT PENDING
Type 10 TD

(Right) Mounting a new wheel in 5 minutes! —

(Right) Operating view of 10 TD shows ample room to comfortably serve two operators. (Twin lights are optional.) Complete operator comfort when grinding wet. Absolutely no spray or splash.



**UNIVERSAL PRECISION
PROTRACTOR — TOOL
GUIDE with DRESSER
grind any size tool
for any desired angle.**

WRITE FOR BULLETIN TW

VISIT OUR BOOTH G-210, National Metal Exposition, Detroit, Michigan, October 15-19, 1951.

ALSO:

**GRINDERS—ALL KINDS
ABRASIVE BELT MACHINERY**

**TO 100 H.P.
• SPECIAL**

- BUFFERS—POLISHERS UP TO 60 H.P.
- TWIN WHEEL TOOL GRINDERS

**THE STANDARD
ELECTRICAL TOOL CO.**

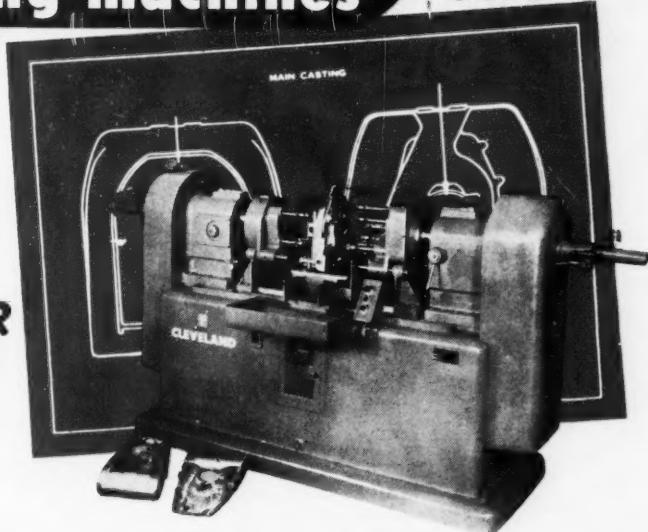
**2487 RIVER ROAD
CINCINNATI 4, OHIO**

CLEVELAND

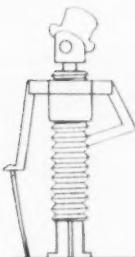
tapping machines

lead
screw

**300
PIECES
PER HOUR**



BOTH SIDES TAPPED IN ONE OPERATION



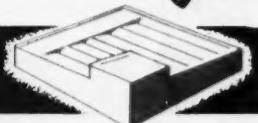
Mr. Lead Screw says... Write for your copy of the Cleveland Production Tapping Guide and a copy of Catalog W-8.

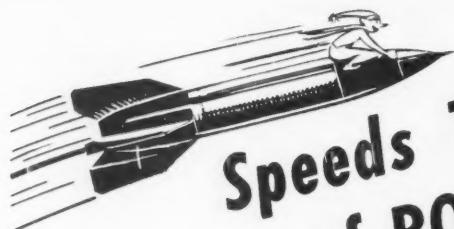
For a leading appliance manufacturer Cleveland engineers designed a Cleveland Tapping Machine to tap four 10-24 and one 6-32 holes in the top face of the main casting and five 10-24 and two 8-32 holes in the bottom face . . . both sides simultaneously all with lead screw controlled spindles to assure complete accuracy. On needed civilian and on defense jobs Cleveland Tappers are reducing production costs and saving priceless man hours. With a Cleveland Tapper engineered to the job, a semi-skilled worker becomes a skilled operator.

CHECK WITH CLEVELAND FIRST if you need to perform any or all of these operations: Tapping . . . Threading . . . Drilling . . . Spotfacing . . . Reaming . . . Chamfering. Cleveland engineers can help you with your problem, show you how to effect economies in these operations.



THE CLEVELAND TAPPING MACHINE CO.
A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.
CANTON 6, OHIO





Speeds THREADING
of ROCKET MOTOR!



5" ROCKET MOTOR — 60 Seconds

Material SAE X-1020 — 450 RPM
4½" Dia. — 12N — Length 11¾"
Single Thread — Tool Kennametal K4H

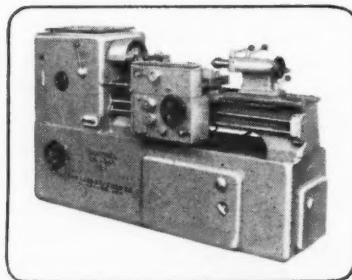
MAKERS of MILITARY EQUIPMENT

Parts and
Components

ARE ALERT TO CRI-DAN
SINGLE POINT THREADING

CHECK THE SPEED, ECONOMY AND VERSATILITY of the Cri-Dan Single Point method of generating threads against any other method, and you'll know why so many production men are going for the Cri-Dan in a big way. Tool costs average only \$3.20. Changeover in 15 minutes! Simple controls enable average worker to produce precision threads.

Contact your Lees-Bradner representative.



The **LEES-BRADNER** Company

CLEVELAND 11, OHIO, U.S.A.

Zooms Screw Machine Output up to 20%!

LIPE Pneumatic BAR FEEDS

For all hand screw machines
from 1" to 2½" capacity.

For small hand screw machines
and specific jobs on Grinnell &
Sharpe automatics.

For tubes or light metal bars up
to 4" diameter.

Production up as much as one-fifth . . .
scrap losses cut sharply . . . fewer inspection
rejects, no spoiled finish! That's the
remarkable record Lipe Pneumatic Bar
Feeds are making in scores of screw
machine departments. Here's why . . .

Faster—feed any length in ONE FEED-OUT

With only one setting, a Lipe Pneumatic
Bar Feed automatically feeds full length
bars or tubes—saves up to 20 minutes on
a 12 ft. bar.

Feeds any shape—round, triangular or
hexagonal—to the smallest possible remnant—never feeds short.

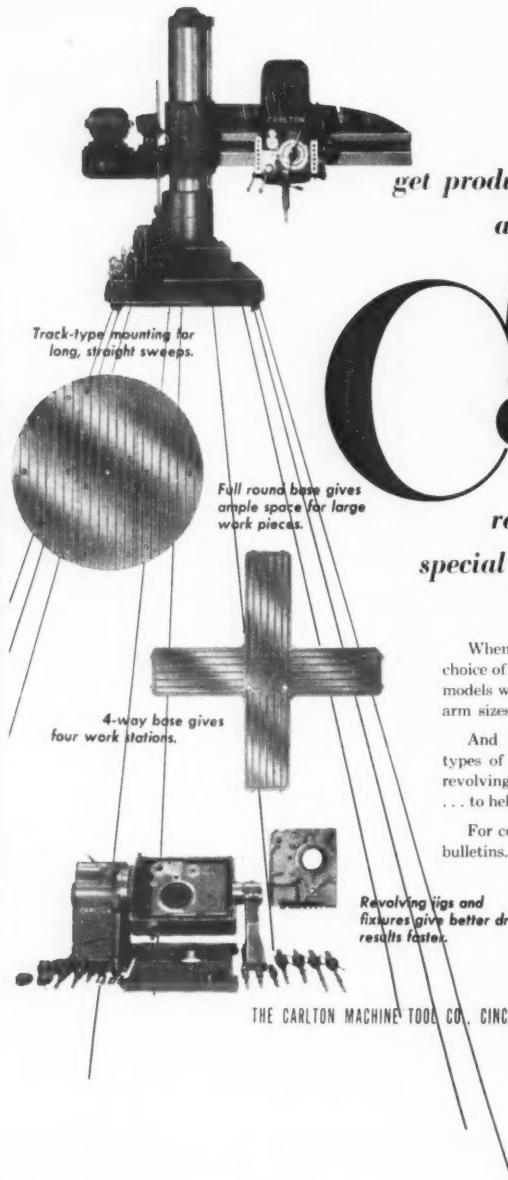
Cuts scrap losses, reduces rejects—no feed
fingers to mar or scratch polished stock,
thin-walled tubes or extruded sections.
Safe—no whirling or whipping of the bar
stock to endanger workers . . . air shuts off
automatically before reloading.

Works on any single spindle screw ma-
chine—automatic or hand-operated, large
or small—where stock is fed through a
spindle. Write today for complete de-
scriptions and engineering data on Lipe
Pneumatic Bar Feeds. No charge.



Lipe - ROLLWAY CORPORATION

Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.



*get production flexibility
and speed with*

Carlton

*radial drills,
special bases and revolving jigs*

When you buy Carlton, you get the widest possible choice of radial drill capacity . . . for there are 4 different models with an almost unlimited number of column and arm sizes.

And special track-type mounting, seven different types of stationary bases, plain or uni-tilt tables, and revolving jigs . . . are available at slight additional cost . . . to help you increase your hole production.

For complete information, send today for descriptive bulletins.

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*When it
comes to production-
come to
Hartford Special*

Automatic Thread Roller

ROLLS 120 to 150 PCS. PER MIN.



Completely Automatic Feed
Filtered Lubrication
Table Top Working Level
Vibration Free Operation
Quick, Easy Set-ups
Class 3 Fits

diam. from .086" to .190"
thread lengths from $\frac{1}{8}$ " to $\frac{1}{2}$ "

WRITE FOR BULLETIN NOW!

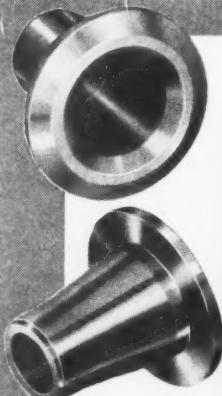
Subject to prior sale
**IMMEDIATE
DELIVERY**
OF LIMITED NUMBER
OF MACHINES

*HARTFORD
Special*

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 12, CONNECTICUT

QUICK JOB CHANGES WITH GREENLEE

automatics



Injector plunger part machined on a 2-inch Greenlee Six from C-1117 bar stock in 59 seconds, to tolerances of 0.002". Former machining time was 3 to 4 minutes per piece on single-spindle equipment.



...INCREASE PROFITS FOR MITCHEL AND SCOTT

The quick change-over features of Greenlee Automatics . . . standarized, interchangeable tool holders, simplified cross-slide camming, rapid stroke-setting arrangement, built-in threading drive, and other important characteristics make them equally adaptable for short or long-run applications.

The Mitchel and Scott Machine Company, Inc., of Indianapolis, Indiana, operate seven Greenlees . . . using them in producing a wide variety of job-shop work. Some of the jobs, such as the one illustrated, run as few as 2000 pieces . . . so set-up time must be reduced substantially to make them show a satisfactory profit.

* If your production schedules are cramped by long, costly set-ups, we'll be glad to make recommendations.



GREENLEE BROS. & CO. 1890 MASON AVE. ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



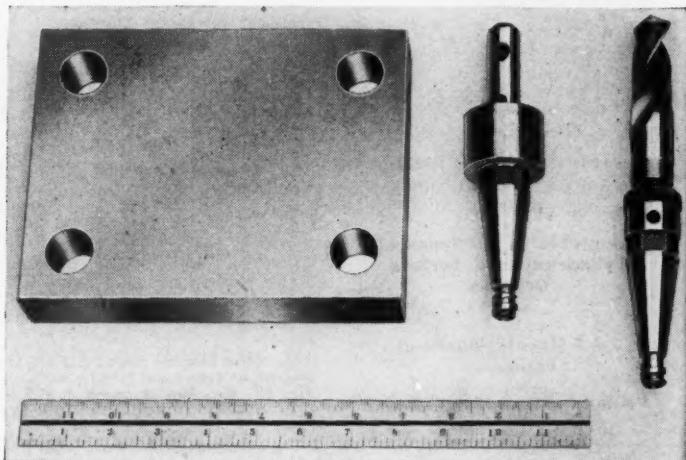
Hole Location Practices

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc. 730 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Pantograph Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

4 HOLES to $\pm .0002''$ in 8 MINUTES

How would you do it?

Sixteen of these pieces were needed. The four 1" holes are $1\frac{1}{8}$ " deep—with location and size tolerance $\pm .0002''$. It would be impossible to obtain such accuracy using a drill jig—and impractical on this short run. Then how could you locate, drill, bore and check the four holes in only 8 minutes?



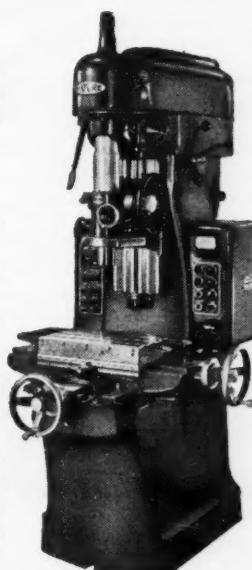
HERE'S HOW:

Using a No. 2 Moore Jig Borer with one $\frac{3}{16}$ " drill and one cut carbide bit, all sixteen pieces (64 holes) were finished in 2 hours and 38 minutes!

FIVE SIMPLE STEPS:

- | | |
|--|----------|
| 1. Load piece (no fixture needed) | 30 sec. |
| 2. Locate and drill 4 holes with $\frac{3}{16}$ " drill at 800 RPM | 240 sec. |
| 3. Bore holes with carbide bit at 1600 RPM | 120 sec. |
| 4. Check last hole and reset bit for next piece | 60 sec. |
| 5. Unload | 30 sec. |
- Total time per piece 480 sec. or 8 min.
Total for 16 pieces (including 30 min. set-up time) 2 hrs. 38. min.

Why make a costly drill jig for those short production runs—or worry about keeping work within close tolerances? The Moore Jig Borer is a necessity in the toolroom; let it help you on tough production jobs, too.



Only tools used on this Jig Borer production job were drill and carbide bit shown.



Have You Bought Your Copy?

Over 7,500 copies of "Precision Hole Location" have been sold to date. Available at special price of \$3 in U.S.A.; \$3.50 outside U.S.A. 448 pages, over 400 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.

DRESS COMPLEX FORMS in one continuous motion

with

J & S
*Fluidmotion**

DRESSERS

Dresses Two Angles Tangent to Radius in One Continuous Motion!

Adaptable to All Types of Cylindrical and Surface Grinders

J & S Elevator Diamond Extension

J & S Adjustable Angle Ramp

You can increase production rates of your grinding machines by reducing time-off for form-dressing. For fastest possible dressing, J & S "Fluidmotion" Dressers are the answer. With "Fluid-

Resulting forms are clean, precise—angles and radii flow into each other. On high production set-ups, sharp contours without tool or chatter marks are consistent to .0001" accuracy.

With today's tight supply of experienced machinists—and ever-increasing demand for faster production—it will pay you to investigate J & S "Fluidmotion" Dressers. They are the simplest, fastest dressers you can buy

J & S "Fluidmotion" Dressers are one of the popular J & S "Machine Shop TIME SAVERS." ("Time Saver" booklet, describing J & S "Fluid-motion" Wheel Dressers, etc., sent on request.)

*Reg.U.S.Pat.Off.

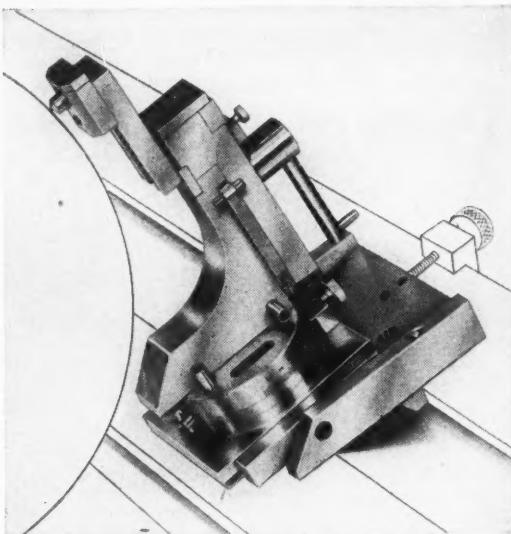


Photo shows how the standard J & S Model "E" Dresser is applied to cylindrical grinder with inclined table, wheel over 14" dia. Two standard J & S attachments (shown above) easily adapt dressers to all grinders.

motion," only one setting is necessary for dressing two angles tangent to a radius—using ONE handle in one continuous motion.

—even beginners can use them to boost production rates of your cylindrical and surface grinders. Write for DRESSER CATALOG.



**475 MAIN STREET
EAST ORANGE,
NEW JERSEY**

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Representatives
In Principal Cities

J & S TOOL CO. INC.

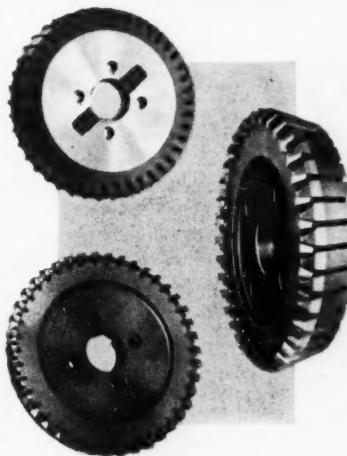
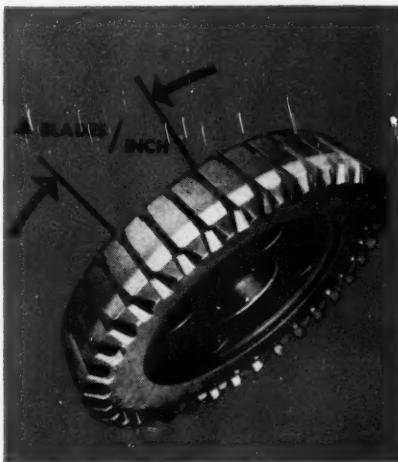
**DESIGNED
TO GIVE YOU
MORE BLADES
PER INCH
OF DIAMETER...**

**...FOR MODERN,
HIGH PRODUCTION CUTTING!**

**WESSON FACE MILLS WITH
WESSONMETAL TUNGSTEN CARBIDE
TIPPED BLADES FOR HIGH SPEED
AND HIGH FEED RATES OF MODERN
MACHINE TOOLS.**

**● FINER PITCH ● REPLACEABLE
BLADES ● INTERCHANGEABLE
WITH SOLID CARBIDE BLADES**

Wesson tungsten carbide tipped blades give you efficiency and economy. Rugged construction, genuine Wessonmetal, replaceable and interchangeable—these features are all combined in Wesson fine pitch face mills to help you cut costs and increase production.

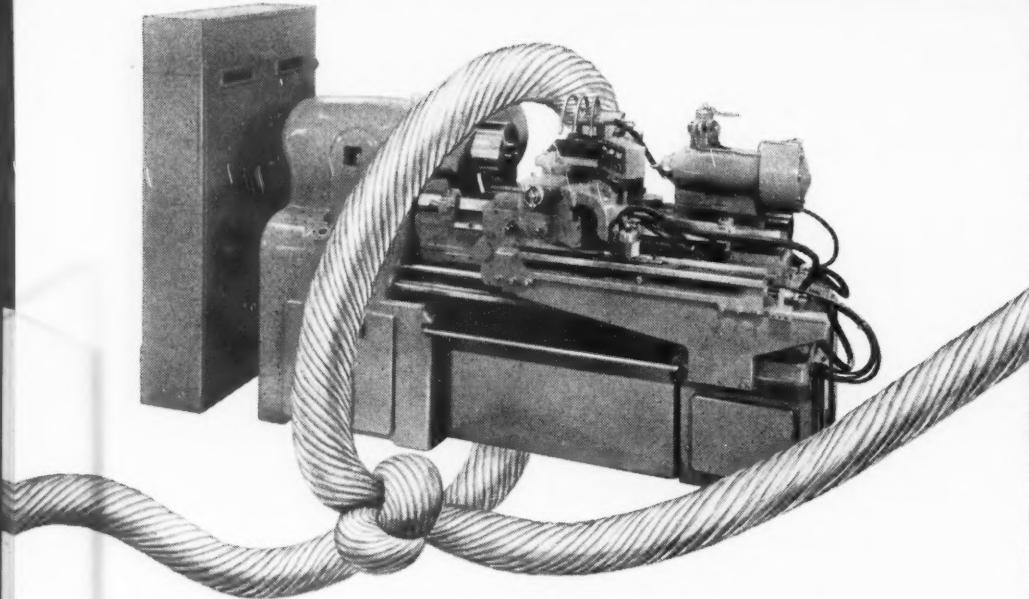


Write for Bulletin

WESSON COMPANY *Affiliated with*
WESSON METAL CORPORATION

1220 Woodward Heights Blvd., Ferndale (Detroit 20), Mich.

**PIONEERS
IN THE ART OF
DESIGNING
AND
PRODUCING
CARBIDE TOOLS**



90% SAVINGS.

Here it is in a nutshell, fresh from the Monarch Mona-Matic installation at the Sargent Engineering Corporation of Huntington Park, California. The part is a fork 6" x 2" OD, made from a 4130 chrome-moly

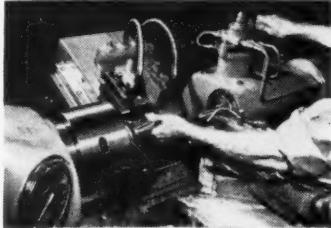
forging heat treated to a hardness of 125,000-145,000 psi before machining—"a tough machining problem from the beginning." Now, look what happened to the production time when the Mona-Matic went to work:

THEN		OPERATION	NOW
Turret Lathe	30 min.	Rough Cut	Mona-Matic 5 min.
Engine Lathe	10 min.	Semi-Finish Cut	
Grinder	10 min.	Finish	
3 Machines		50 min.	1 Machine 5 min.

That makes a 90% reduction in machining time alone, and it's just the start! Set-up time for the job has shrunk from more than 3 hrs. to less than 20 min. One machine has replaced three. Only one operator is required (and he could easily handle two Mona-Matics if necessary). Add all that up—and is there anything

more that we have to add to it?

What is this machine that consistently turns out production savings like this on short runs and long ones alike? That's where the string on the story comes in! Aren't you convinced that you'd better return our handy coupon right now? . . . *The Monarch Machine Tool Co., Sidney, Ohio.*



THE MONARCH MONA-MATIC (Main Illustration and Above, with Work Piece). This is a new and outstandingly successful approach to production metal turning. Use of a single tracer-controlled running tool speeds production, slashes tool costs, tool change time and set-up time, increases accuracy, and slashes time required for subsequent grinding operations. Available with magazine load.

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FOR A GOOD TURN FASTER... TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: I am interested in your Mona-Matic story and would like to receive your illustrated Booklet, with complete data and job performance reports. Please send me your Booklet 1804 without obligation.

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COMPANY _____

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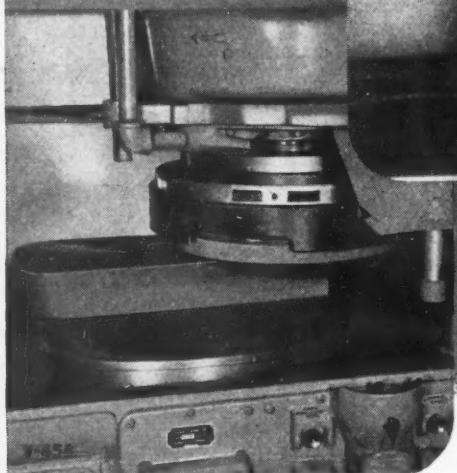
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for your BLANCHARD

So easy!

lower head
onto wheel
and clamp -



-then grind!

Blanchard wheels are engineered for Blanchard Grinding

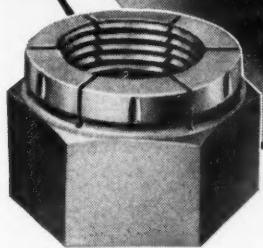
The NEW Blanchard Wheel Holder eliminates sulphuring — try it with Blanchard wheels and be convinced that it will — **SAVE TIME**
SAVE MONEY
SAVE TROUBLE

See your Blanchard distributor or
write direct for full information!

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SELF-LOCKING NUTS

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Perhaps you have a vibration problem. If so, send for samples and literature.

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Precision-made end mills that meet the highest standards of cutter design cut faster, more freely, and with less power. They turn out more work between sharpenings—reduce machine down time.

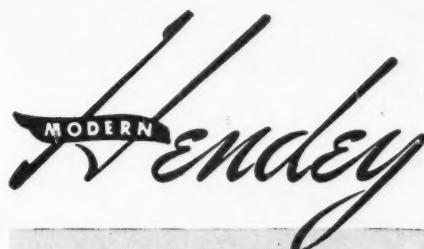
Brown & Sharpe End Mills are made under exacting quality control, from start to finish. Steel formula and heat treatment are closely held to rigid specifications. Careful machining maintains consistent adherence to design standards. Write for complete catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

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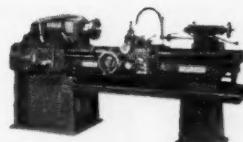
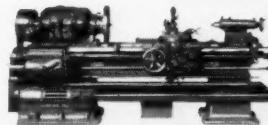
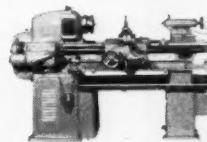
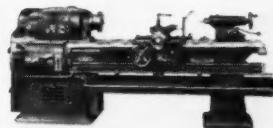
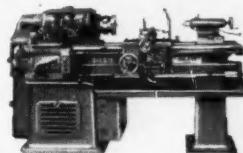


engine lathes

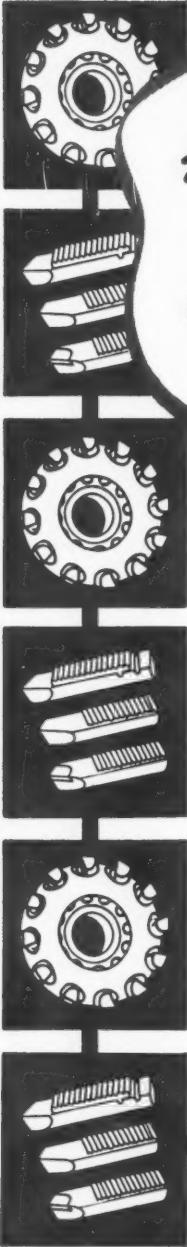
for every precision turning requirement



The full line of Hendey Precision Engine Lathes includes light, medium and heavy duty models for tool and gage jobs and manufacturing work. Hendey "plus" features include rugged construction, hardened and precision ground bed ways, convenient, simplified controls, and all the latest construction details to minimize maintenance and prolong original Hendey precision. If you're looking for the best—for life—investigate the complete line of Hendey Precision Engine Lathes!



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All Lovejoy Blades for
Type "A" Milling Cutters
are interchangeable from
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... and this applies to
every "A" cutter ever made!

Lovejoy Type "A" face milling cutter blades offer unsurpassed economy — 1) they are interchangeable throughout the complete range of housing sizes, 2) H.S.S., carbide and cast alloy blades are interchangeable in every housing, 3) every blade will fit every Type "A", even if you have housings 30 years old, 4) only a minimum of stock must be removed when sharpening, 5) a large percentage of every blade is usable; 6) there is no need to carry a large inventory, as Lovejoy can supply blades promptly from stock. For superior performance, plus maximum economy, use Lovejoy Type "A" for every face milling job.

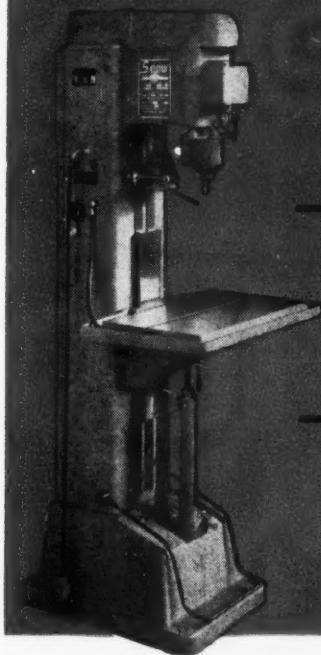
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FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

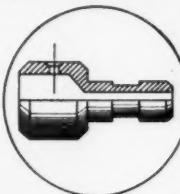
Crossdrill and C "T" Sink 1/16" Hole

Material—Brass

Production—4800 per hour

Fixture—#15 Vertical index

Equipment—#1-UD Drilling
Machine



TAPPING

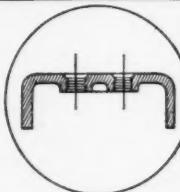
Tap Two #10-32 Holes

Material—Steel stamping

Production—3800 tapped holes
per hour

Fixture—#14 horizontal index

Equipment—#1-UT tapping
machine



THREADING

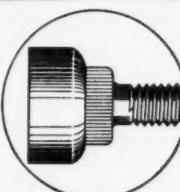
3/8"—24 Thread—1/2" Long

Material—Die Cast Aluminum

Production—2500 per hour

Fixture—#10 Drum dial

Equipment—#3-TR Threading
machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

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a handful of help for your close-quarter work



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CAPACITY TO $\frac{1}{4}$ "

A small chuck—just $1\frac{3}{16}$ " O.D.—designed to do a big job, especially when tool space is limited. Low in first cost, lower still in maintenance—jaws are easily replaced in

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J-Model
"ROCKWELL"
HARDNESS
TESTER



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MICROHARDNESS TESTING

See how easy it is to be sure
of the hardness of metals you
process — by using WILSON Hardness Testing equipment

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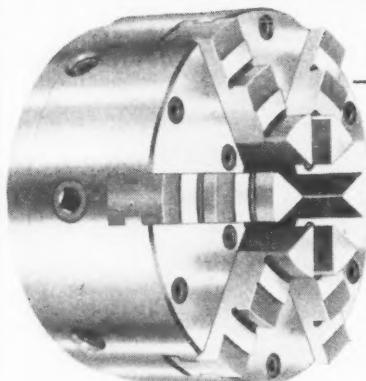


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This is the first **and only** successful dual control chuck. Its operation is easy to understand and use. One pinion (see center of chuck body above) moves jaws in or out to grip work—just like any scroll chuck. 4 opposed screws (only two can be seen in photo) work on the chuck adapter to bring work to dead center. Even dubs have centered work within .0005" in 3 minutes. Once set dead true, hundreds of duplicate parts can be machined without changing adjustment.



**.0005" PRECISION IN 1 MINUTE!
RECHUCKS TO .0005" WITH
SCROLL CHUCK SPEED !**

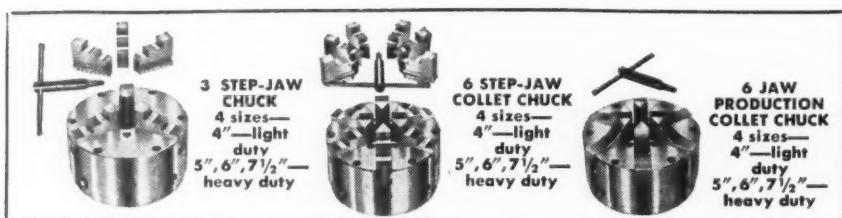
Breaking bottlenecks on precision work is made-to-order for a Buck Ajust-Tru!

Completely outclasses 4-jaws on set-up speed and rechucking speed! Lines up dead true in **one minute or less**—maintains .0005" accuracy when rechucking duplicate parts **with no further adjustment**.

Many other outstanding features. A 6" 6-jaw Buck handles the work of 93 collets—yet is priced in line with ordinary chucks!

This is just part of the complete Buck story. Send for literature and full details.

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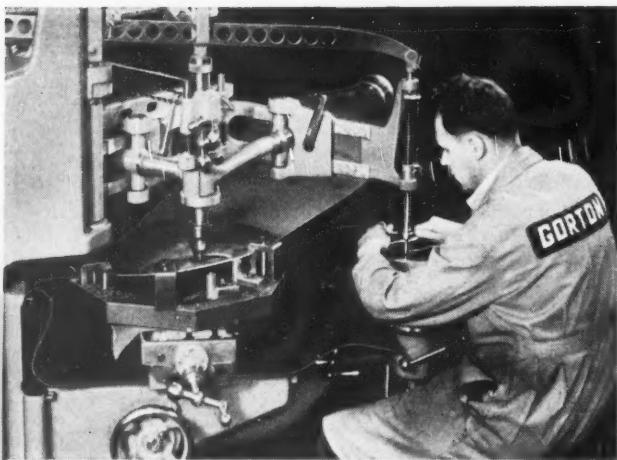


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Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

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by
GEORGE GORTON III
Executive Vice-President,
George Gorton Machine Co.



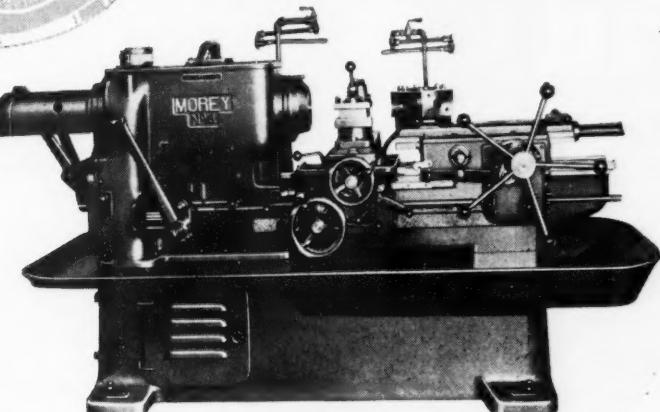


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TURRET LATHES

No. 2 Plain Type

Nos. 3, 4 and 5 Universal Type



Features

Infinite variable vibrationless spindle speeds.

Remote speed selection control for speed and ease of operation.

The newly designed MOREY TURRET LATHES take advantage of tungsten carbide tools and incorporate all technical improvements in metals, electronics and hydraulics . . . our design is not hampered by tradition.

Size	Bar Capacity	Swing	Motor
No. 2 Plain . . .	1" x 6"	14"	3 HP
No. 3 Universal . . .	1 1/2" x 10"	16 1/2"	5 HP
No. 4 Universal . . .	2" x 12"	19 1/2"	7 1/2 HP
No. 5 Universal . . .	2 1/2" x 14"	21 1/2"	15 HP

FOR BAR and CHUCKING WORK

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Avey BMA-6 TOOL ROOM DRILL

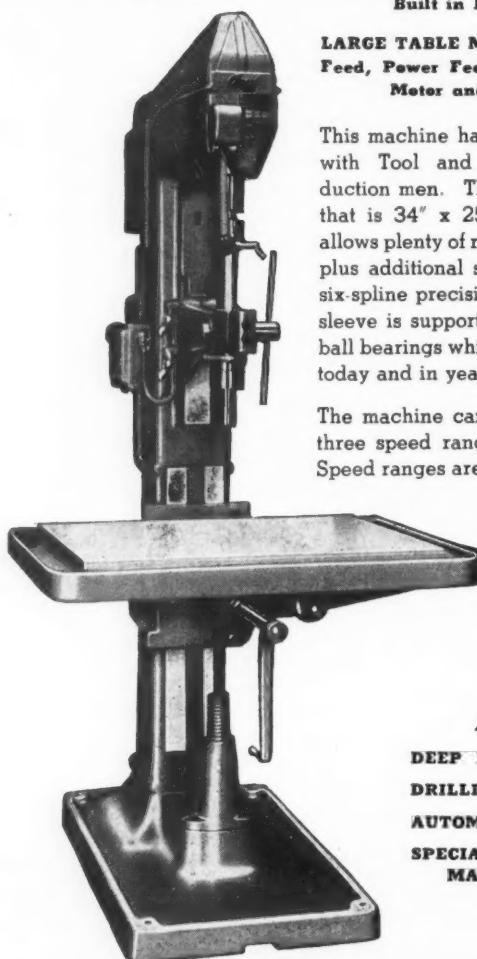
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LARGE TABLE MACHINE having either Hand Feed, Power Feed, *Avey-Matic* or Reversing Motor and Control for Tapping.

This machine has proved to be very popular with Tool and Die Shop men, also production men. The large heavily ribbed table that is 34" x 25", plus ample chip trough, allows plenty of room for large dies or fixtures, plus additional space for tooling, etc. Each six-spline precision ground spindle and drive sleeve is supported by five rows of precision ball bearings which give the precision needed today and in years to come.

The machine can be obtained with either of three speed ranges: low, medium, or high. Speed ranges are easily changeable for future

jobs requiring higher or lower speeds, which is a necessity today with ever-changing design. Where power feed is desired four rates of feed are furnished.



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PRECISION GROUND
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AND DIES



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PARTS



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Jigs, Templates, Tools
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**JUST MARK IT
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**OVER 200 SIZES
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AVAILABLE ANYWHERE!

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SEND FOR BULLETINS AND FLAT STOCK CHART
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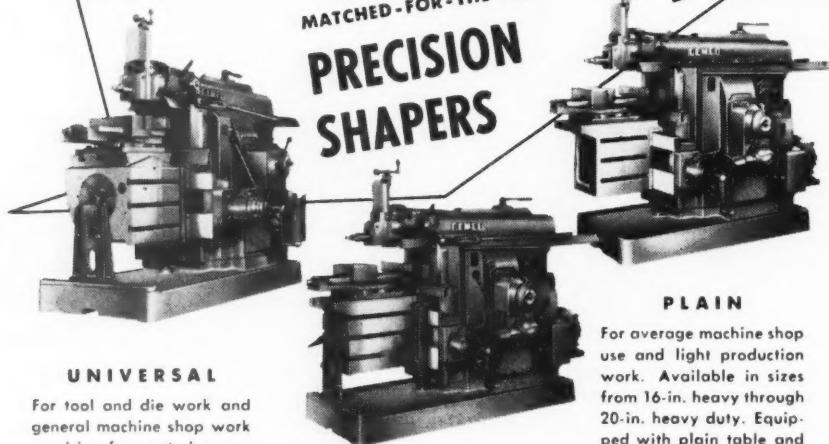
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ARE NOW PAYING FOR THROUGH
COSTLY OBSOLESCENCE..."

INCREASE PRODUCTION
WITH MODERN **GEMCO**

MATCHED-FOR-THE-JOB

3
MODELS

PRECISION
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For tool and die work and general machine shop work requiring frequent changes and angular settings. In sizes from 16-in. heavy duty to 36-in. standard duty, with Front Table support. LUBRIGARD protected.

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For general machine shop use and heavy production work. In sizes from 16-in. heavy duty to 36-in. standard duty and with separate Table and Apron and with Front Table support. LUBRIGARD protected.

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For average machine shop use and light production work. Available in sizes from 16-in. heavy through 20-in. heavy duty. Equipped with plain table and with or without Front Table support. LUBRIGARD protected.

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SIMONDS
ABRASIVE CO.

Grinding Wheels

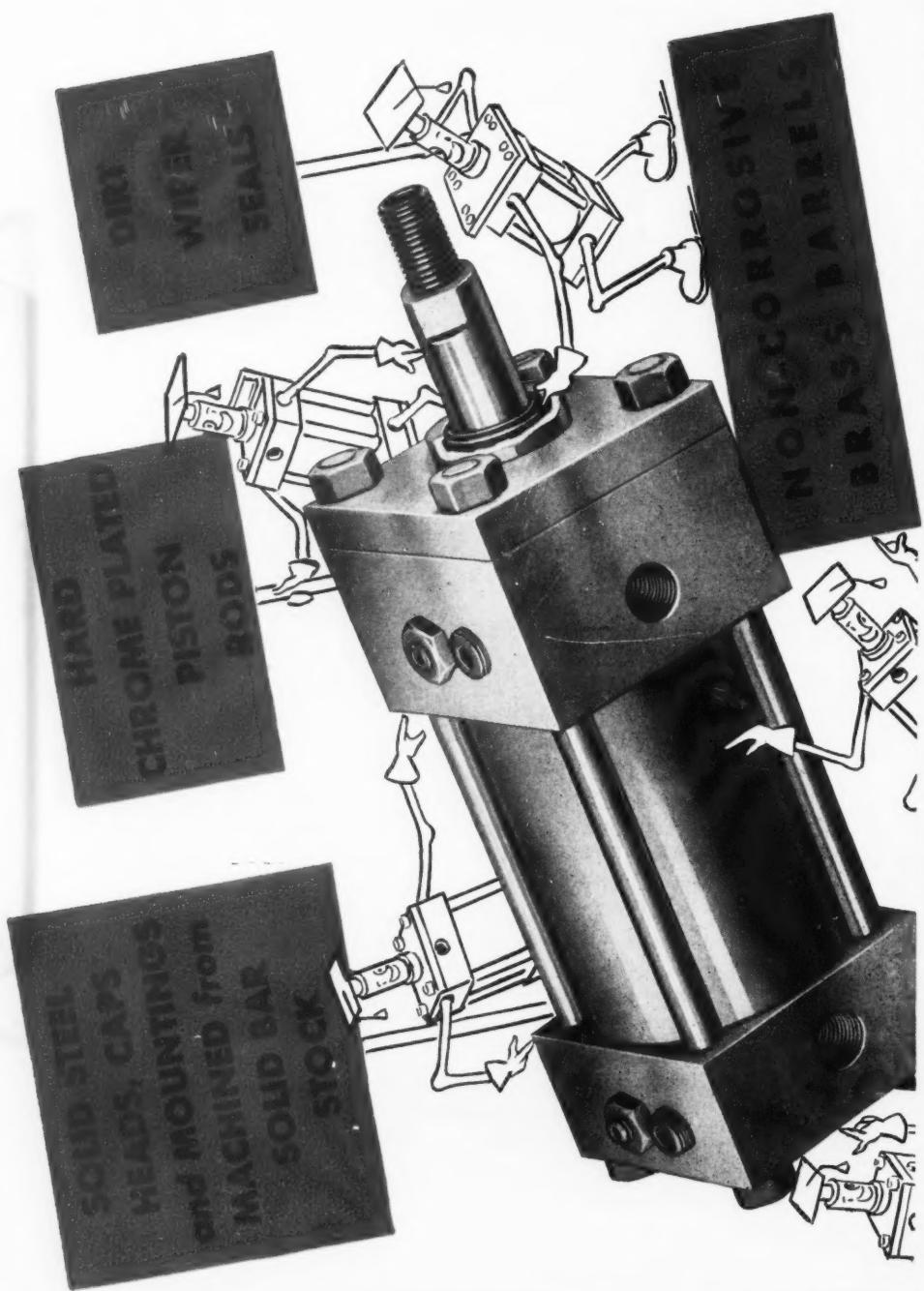
ALL'S HARMONY in the grinding department

For better output, these boys know the score. It's Simonds Abrasive Company grinding wheels for the stepped-up tempo of defense requirements. Simonds complete line has everything to keep *your* production in tune with today's needs . . . grinding wheels for every operation, mounted wheels and points, segments and abrasive grain . . . top quality products backed by Simonds Abrasive Company's reputation as a major grinding wheel manufacturer for almost 60 years. Write for free grinding data book listing name of your Simonds distributor.



**SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES**

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.





AIR CYLINDERS

Meet J. I. C. PNEUMATIC STANDARDS

(Write for FREE copy of these "Standards")

The four features illustrated above serve to show how Miller Air Cylinders *for years* have been meeting—*even exceeding*—the high quality set by the recently adopted J. I. C. Pneumatic Standards for Industrial Equipment. See for yourself! . . . write for our free bulletin A-105 and receive also your own *free* personal unabridged copy of these "Standards" with standard symbols, sample circuit, interesting point-by-point comparison—all neatly compiled into a handy booklet that fits your reference file and folds to fit your pocket.

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, $1\frac{1}{2}$ " TO 20 " BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, $1\frac{1}{2}$ " TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI HIGH PRESSURE HYDRAULIC CYLINDERS, $1\frac{1}{2}$ " TO 12" BORES, 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.



MILLER MOTOR COMPANY

DEPT. M, 2024 N. HAWTHORNE, MELROSE PARK, ILLINOIS

AIR AND HYDRAULIC CYLINDERS ACCUMULATORS COUPLERS HOSES AIR ROTORS

CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON

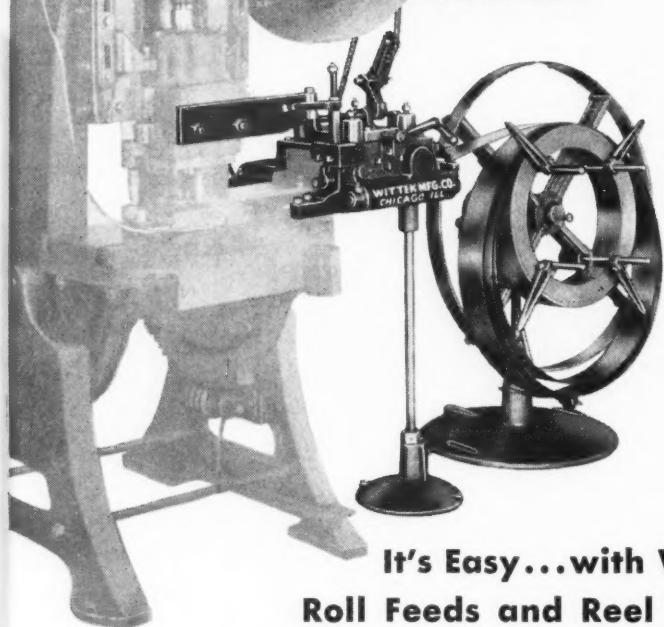
HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS

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Sales and Service from coast to coast
ST. LOUIS and OTHER AREAS.



make your PUNCH PRESSES *Automatic*



**It's Easy...with WITTEK
Roll Feeds and Reel Stands**

Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions. They are reliable and accurate with simple, quick adjustment of feed length. Standard sizes and models meet a wide variety of press size and capacity conditions.

Wittek Reel Stands facilitate handling coiled stock.

Write for full particulars

WITTEK Manufacturing Co.

4322 W. 24th Place, Chicago 23, Illinois



SAVES 5 1/2 HOURS GRINDING FORM TOOL

DoALL "COOL-GRINDING" PRINCIPLE

(U. S. PATENT NO. 2470350)

MAKES POSSIBLE FASTER WORK,
GIVES STRAIGHTER CUT,
PREVENTS WARPING

TAKE a tip from Biddle Screw Products, Sheridan, Indiana. The carbide bar in one of their large screw machines would warp under normal cutting conditions. The cut was taking $\frac{3}{4}$ of a day and the piece wasn't always satisfactory.

Then they turned to DoALL "Cool-Grinding" of the carbide bar. The coolant flows through the wheel and atomizes at the point of work. Standard wheels are used.

RESULTS? No warping, a straight cut, perfect pieces—and only 30 minutes to do the job!

You wouldn't believe tool grinding could be that important, but DoALL "Cool-Grinding" does produce amazing results everywhere it is used.

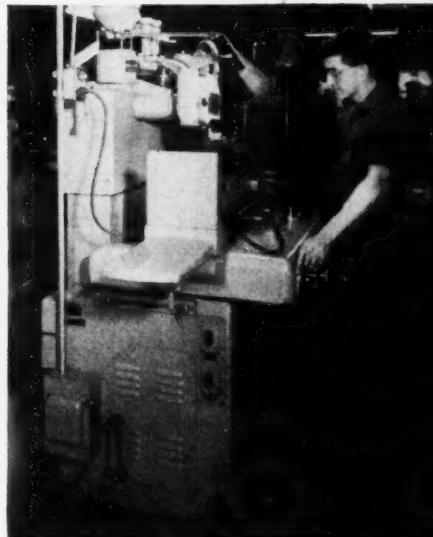
SEE FOR YOURSELF. Ask to have a Free DEMONSTRATION right in your own plant. Call your local DoALL Sales-Service Store or write:

THE DoALL COMPANY

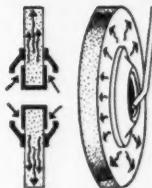
254 N. Laurel Ave., Des Plaines, Ill.

SEND FOR CATALOG TODAY

Lists all models of DoALL Precision Grinders for tool-room and production work.



"COOL-GRINDING" COOLS AT POINT OF CONTACT . . .



Coolant is metered into the hub of the wheel, forced centrifugally through the pores and out in a fine mist at the point of contact of wheel and work.

INDUSTRY'S
NEW
TOOLS

DoALL

27
SALES-
SERVICE
STORES



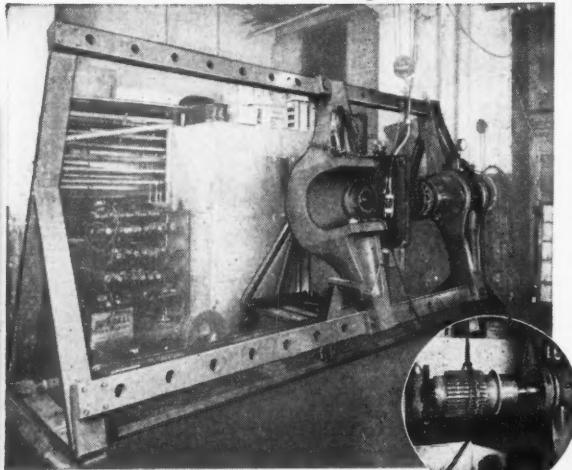
Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

CALL DoALL FOR:



**For Fast, Efficient Pressing,
Bending, Forming, Straightening...**

New Rodgers FORCING PRESSES



...With These Features of Construction and Operation

SEPARATE PUMPING UNITS—Choose from individual hand-operated or power-driven pumps to operate any model Rodgers Forcing Press. **REMOTE CONTROL OF POWER PUMPS**—Operator can control press from any desired position. **REMOVABLE HYDRAULIC CYLINDER**—Cylinder is easily removed from head member to permit servicing or use for other power applications. **INDIVIDUAL FRAME UNITS**—Tracks, tension bars, abutment member and head member are all separate units to facilitate handling and erection of press. **EXPERTLY ENGINEERED AND CONSTRUCTED**—All units of Rodgers Forcing Presses are made strong, durable and dependable to give years of reliable service.

...In These Types and Sizes

Rodgers Versatile Forcing Presses are available in portable or stationary models—horizontal, vertical, 75° or 90° inclined—100 to 600 tons—with hand-operated or power-driven pumps. In this broad selection, you'll find the ideal press to meet your requirements.



Rodgers Hydraulics, Inc.

7447 Walker St., St. Louis Park, Minneapolis 16, Minn.

HYDRAULIC POWER EQUIPMENT

Rodgers 300 Ton, 75° Inclined, Stationary Forcing Press, one of many in the complete Rodgers line. In the application shown, the press is being used efficiently to press an armature shaft.



Separate Power Pump

Select your press operating unit from hand-driven pumps or power-driven pumps. Shown is a Rodgers 2-cylinder Power Pump with remote control.

Send for New Catalog

For full details and specifications on the complete line of Rodgers Forcing Presses send for Catalog 315.



SPEEDS UP OPERATIONS IN TOOL ROOMS
... ON PRODUCTION LINES

DREMEL Electric MOTO-TOOLS

UL
ELECTRICAL INSPECTION SERVICE
DOUBLES THESE
OPERATIONS
BETTER—FASTER

GRINDING
DRILLING
BURRING
POLISHING
DRESSING
SHARPENING
ENGRAVING

WRITE
FOR
INDUSTRIAL
CATALOG

APPROX.
27,000
R.P.M.

MOTO-TOOL KIT NO. 2 contains 23 accessories, including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case \$23.50

MOTO-TOOL NO. 2, with one emery wheel point \$16.50

Dremel HIGH-SPEED STEEL CUTTERS and balanced wheel points are available for all makes of hand grinding tools. Write for literature.



"The Pocket-Size Machine Shop"

Dremel Moto-Tools are time tested—have been widely used in industry for over fifteen years. A veteran of World War II, Moto-Tool served in war plants and at military maintenance bases throughout the world. Thousands of these mighty mid-gets helped to make the atomic bomb—were used to establish production records in defense industries during the last war. Hundreds of toolroom and production line operations, such as polishing and grinding dies, burring parts, marking tools, sharpening cutters, touch up jobs, etc. are accomplished in seconds, without tearing down "set-ups." Moto-Tool is sturdily constructed for long lasting industrial service. Weighs only 13 oz.—dynamically balanced for vibrationless operation.



DREMEL MFG. CO. Dept. 221-K **RACINE, WIS. U.S.A.**

MAGNETIC CHUCKS BY *Magna-Lock*

...largest exclusive builder of magnetic chucks

3 TYPES
for every flat-
surface machining
job ... large or small!

RECTANGULAR ... work held
to extreme edges of chuck. Sizes
to 36" x 96".

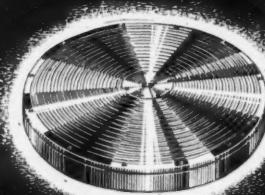
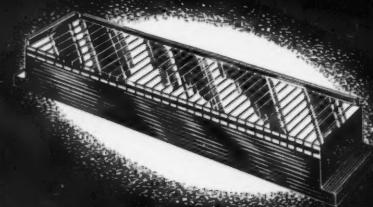
ROTARY ... inserted ring-type,
6½" dia. to 48½" dia. Also
sectional type for automatic
loading, unloading.

SWIVELING ... for knife and
shear blade grinding, many
machining operations.



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Devices.

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MM-101



Magna-Lock

Hanchett MAGNA-LOCK CORPORATION
Magnetic Chucks and Devices
BIG RAPIDS . . . MICHIGAN, U. S. A.



Why EVERY plant needs DoALL Gage Blocks

DoALL Gage Blocks measure in *millionths*. Does every plant need such accuracy?

YES—to control tenths and thousandths. The Tool and Gage Makers Tolerance Chart reveals that to produce a shaft to $1.000 \pm .005"$ tolerance:

1. The *Working Gage* at the machine must be accurate to $\pm .0005"$, ten times that of the part.
2. The *Inspector's Gage* must be accurate to $\pm .00005"$, ten times that of the working gage.
3. The *Master Gage* which checks the inspector's gage must be ten times more accurate or $\pm .000005"$.

There is your requirement for *millionths accuracy*—and with it you'll cut rejects to the vanishing point.

This kind of accuracy is not a luxury. DoALL Gage Blocks are economical, long-lived *working tools* for checking not only other gages but finished parts as well.

For example, with a set of 83 DoALL Gage Blocks and several accessory pieces you can make 120,000 different snap gages for about $\frac{1}{4}$ cent each! And these are gages accurate to millionths, with dimensional stability that keeps them accurate.

Ask to have a DEMONSTRATION of DoALL Gage Blocks in your plant. There are none finer. See for yourself. Call your local DoALL Sales Service Store or write:

THE DoALL COMPANY
254 N. Laurel Ave., Des Plaines, Ill.

WRITE FOR LITERATURE and ask about DoALL Gage Block CALIBRATION SERVICE that assures you of faithful accuracy.



INDUSTRY'S
NEW
TOOLS

DoALL

27
SALES-SERVICE
STORES

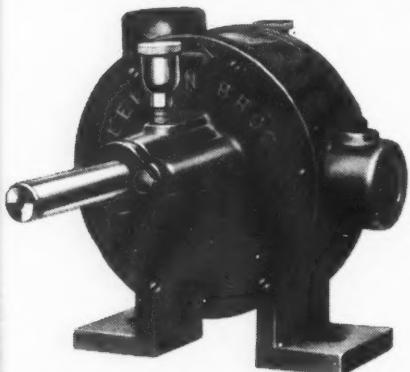


Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

All these are
"LOW PRESSURE"
 AIR JOBS

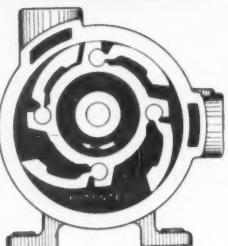
Agitating—blowing—holding—
 chucking—sorting—cleaning—drying—
 cooling—separating—mixing—feeding—
 leak-testing—pressure-boosting—
 materials transfer, etc.

—handled better, at lower cost, with



TAKE UP THEIR OWN WEAR

Exclusive Leiman hinged wing design permits wings to wear uniformly, maintaining full pressure or vacuum, after 15 and 20 years' steady service.



WRITE on firm letterhead, for free catalog and application folder.

LEIMAN BROS., Inc.
 168 Christie St., Newark 5, N. J.

LEIMAN AIR PUMPS

(Pressure, Vacuum, Suction)

On hundreds of air applications requiring pressures lower than 25 p.s.i. or vacuum under 29" mercury, Leiman Rotary Positive Air Pumps are providing these advantages over any other source of air:

- Even, pulseless flow of air.
- No expensive installation, no tanks.
- Air available instantly—no waiting to build up pressure.
- No waste—runs only when air is needed.
- Very compact and portable—plug in and use anywhere.
- Provides both pressure and vacuum-suction from same source, by switching from outlet to inlet.
- Extremely quiet and trouble-free for years.
- Little or no maintenance.

*What is your operation or problem?
 Send us details for recommendation,
 without obligation.*

AIR PUMPS • AIR MOTORS • SAND BLASTS • DUST COLLECTORS

TO INSURE LOW CUTTING TOOL COST

1 Be sure of uniformity

2 Be sure of top performance

3 Be sure of 100% inspection—
each tool individually inspected

4 Be sure they're Butterfield
...the tools that meet
all three specifications



BAR STOCK is here tested at
Butterfield for microstructure.

A complete line
for all types of applications.
Made in high speed or carbon steel
for best results on every job.

See Your Nearby
Butterfield Distributor
For Prompt Deliveries
and Service

Union Twist Drill Company
BUTTERFIELD DIVISION
Derby Line, Vermont
In Canada: Rock Island, Quebec



BUTTERFIELD
THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

IT'S THE Cost per Cut THAT Counts

Study these high production, low cost figures on three Motch & Merryweather Circular Sawing Machines

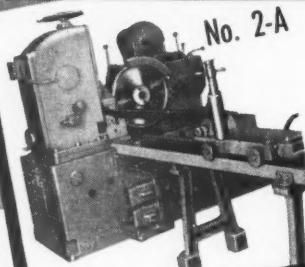
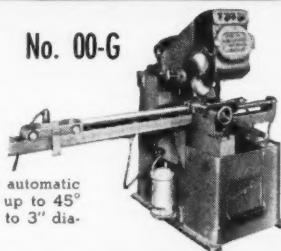
Make your own study of the cost per cut in your metal-sawing department. Then find out from Motch & Merryweather how much production at lower cost you can get on M. & M. Circular Sawing Machines, using our Triple-Chip blades.



Operation: Steel door frames (mitre cut).
Material: Rolled steel shapes 6" wide x 1/16" thick
Production: 200 pieces per hour.
Tool cost per piece: \$.0002.

M. & M. No. 00-G Circular Sawing Machine. Manual or automatic stock feed. Readily adaptable to making cuts at angles up to 45° as well as high production square cut-off. Capacity: up to 3" diameter round, shapes—up to 3-3/8" x 6".

No. 00-G



No. 2-A

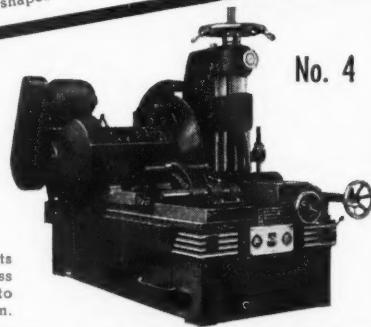
Operation: Rocket nozzle stock cut to length.
Material: S.A.E. 1020, 5" diameter.
Production: 60 pieces per hour.
Tool cost per piece: \$.001.

The No. 2-A machine pictured at the left has automatic stock feed up to 72" cut-off lengths. It is offered also with manual stock feed. Capacity: up to 6-1/2" diameter round; structural shapes—up to 5" x 12".



Operation: Forging billets cut to length.
Material: S.A.E. 1045, 14" square.
Production: 6 pieces per hour.
Tool cost per piece: \$.12.

No. 4. Widely used in steel and structural steel plants and forge plants sawing all types of forging, stainless and titanium alloys, die block steel, etc. Capacity: up to 17" dia. round; structural shapes up to 24" I-beam.



No. 4

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
 715 PENTON BUILDING • CLEVELAND 13, OHIO
 Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines



PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

IT'S A
mac-it[®]

PRONOUNCED
"MACK-IT"

Mac-it $\frac{3}{8}$ " x 2 $\frac{1}{2}$ " Square
Head Set Screws have a
grip of more than 25 tons.



BUILT FOR STRENGTH!

For the toughest kind of fastening jobs, the complete Mac-it line of heat-treated, alloy steel screws will give you the strength you need *where you need it!*

Mac-it's 38 years' experience in the manufacture of these top-quality fasteners is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada.

Other Mac-it products include:

Hollow Lock Screws

Hollow Pipe Plugs

Socket Head Cap Screws

Socket Screw Keys

Hollow Set Screws

Hexagon Head Cap Screws

Stripper Bolts

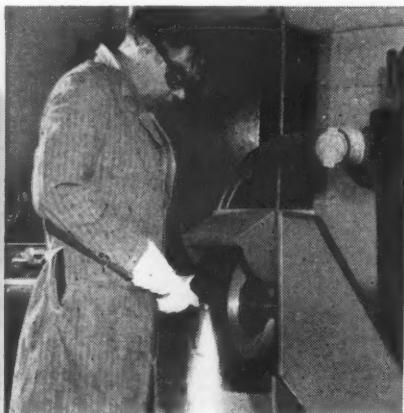
... and many others

Marketed Nationally Since 1913 by
STRONG, CARLISLE & HAMMOND COMPANY

Cleveland 13, Ohio

Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

YOUR GRINDING COSTS MAY BE TOO HIGH!



GET FAST, EXPERT HELP with your grinding problems at the nearest 3M BRANCH Demonstration Room. Or we'll be glad to have a trained representative call on you and explain the savings you can make by converting your present equipment to the 3M Method.

Minnesota Mining & Mfg. Co., Dept. MMS1051
St. Paul 6, Minn.

Please send 1951 edition of "Step UP Production."

Have a 3M Methods Engineer call.

Name _____

Firm _____

Address _____

City _____ Zone _____ State _____

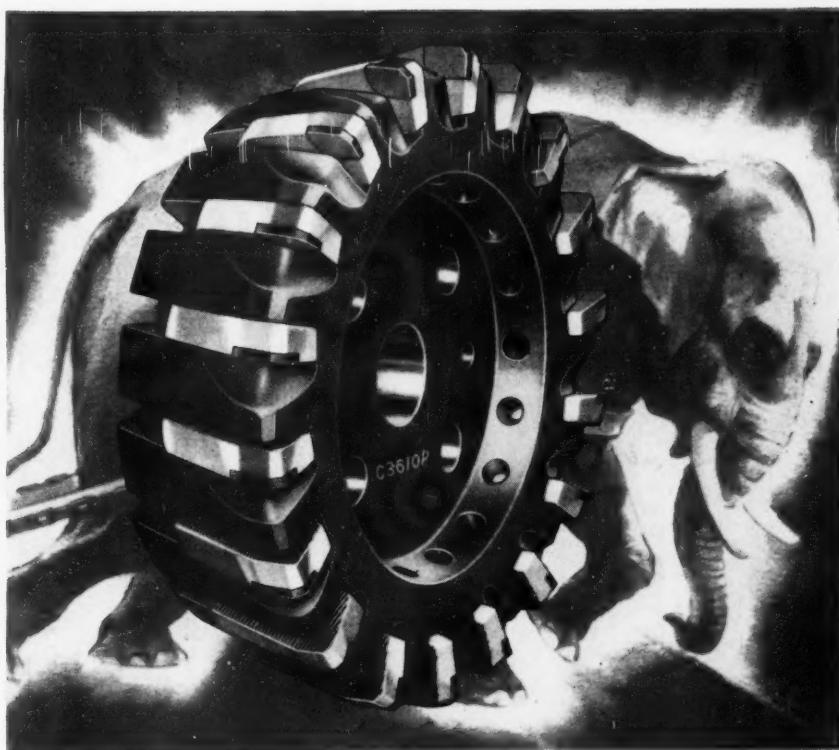
New booklet shows how the 3M Method reduces grinding and finishing costs up to 85%

You can cut grinding time on every operation, enjoy new production economies by converting your *present* equipment to the 3M Method of Grinding and Finishing.

The new 1951 edition of our popular case-history booklet "Step Up Production" has 36 fact-filled pages of interesting pictures and stories. Use the coupon below for your free copy and read how the 3M Method has helped countless manufacturers increase output while cutting expenses!



Made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3-M" Adhesives. General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N.Y. In Canada: Minn. Mining & Mfg. of Canada, Ltd., London, Canada.

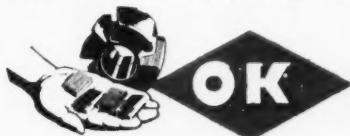


Pull...like a bull elephant

OK DUAL ADJUSTMENT milling cutters, size for size, are the huskiest produced. In simplicity lies their great strength. There are just two parts — body and blades . . . uncomplicated or weakened by cut-outs or recesses for locks, pins, gibbs or gadgets. Bodies are drop-forged, with slots positioned to micrometer dimensions. Blades are available in high speed, alloys or carbide.

The drive-fit insures a secure seat. Mating

serrations prevent blade movement except for advancement to compensate for wear. This simple construction permits the use of more blades in the fine pitch series and heavier blades in the coarse pitch series. OK cutters convert the full horsepower available without losing a kick, remove the maximum amount of metal — measured in speed, feed, chips, minutes, power consumption or man hours. Do you have a copy of the OK catalog 13?



**modern milling cutters
for modern milling machines**

THE OK TOOL COMPANY, Milford, New Hampshire

WHY IT PAYS TO STANDARDIZE ON

WALES SHEET METAL EQUIPMENT

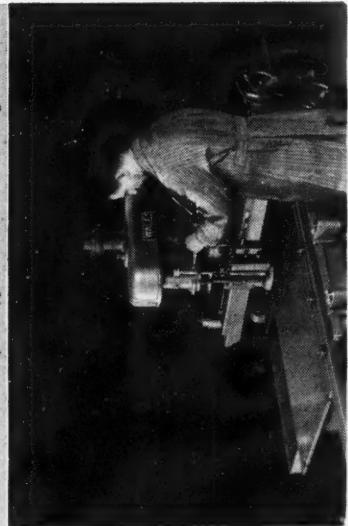
● In practically every sheet metal fabricating plant or department there is a need for Wales Machinery and Equipment. Standardizing on this versatile line assures the exact type for various operations.

For example, hole punching and notching operations may be performed on either the Wales Fabricator or on the Wales Twin Column Press with Wales Hole Punching and Notching Units. Depending on the number of parts and the size and shape of the work, one piece of Wales Equipment is more efficient and economical than the other.

To fully determine which Wales Equipment is most applicable to a particular type of work, call on Wales Engineers who have years of experience in the most economical way to fabricate sheet metal parts. Yes, make it standard practice to call on Wales Engineers FIRST for their valuable suggestions.



WALES SHEET METAL FABRICATOR provides rapid interchangeability for punching and notching. Work from blue prints or operation sheets. No Template Required. Write for Catalog 10-A.



WALES-STRIPPIT CORPORATION

GEORGE F. WALES, Chairman

398 PAYNE AVE., NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

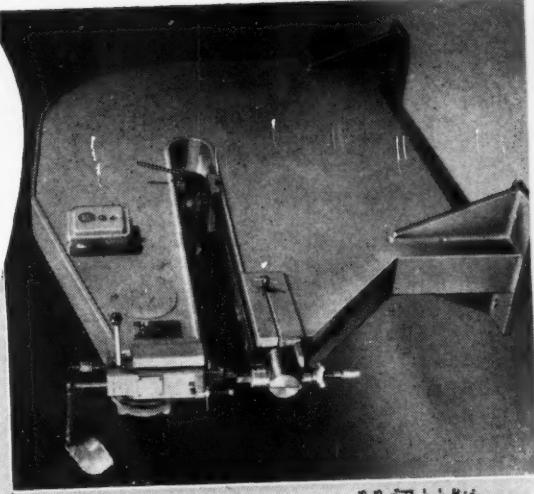
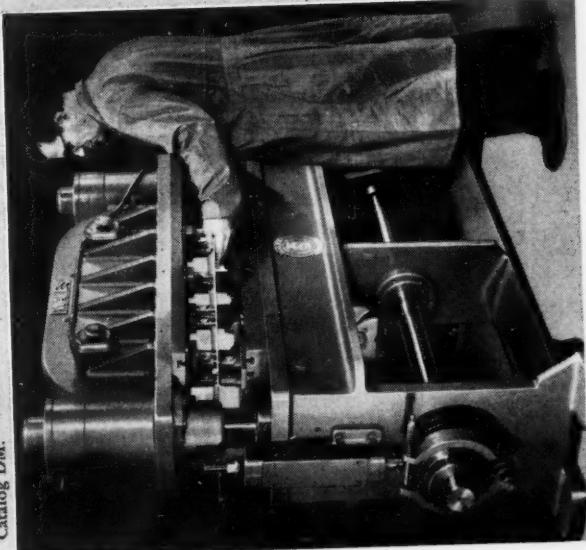
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

WALES DRILLING MACHINE is specially designed to meet the exacting requirements of locating, drilling and reaming holes in materials of practically any length and up to 36" wide. Write for Catalog DM.



WALES TWIN COLUMN PRESS features simplicity of design that fulfills the engineering axiom—"building it simple builds it better." In many cases, this press eliminates the necessity of a die set. Write for Catalog TC.



WALES CONFORM SHEAR cuts and trims irregular shapes and circles and also bevels, riddles, forms and flanges. Ideal for accurate, short run work eliminating prohibitive die costs. Send for Catalog TS.

WHAT METAL CUTTING CAPACITY DO YOU NEED?

Kalamazoo **BAND SAWS**

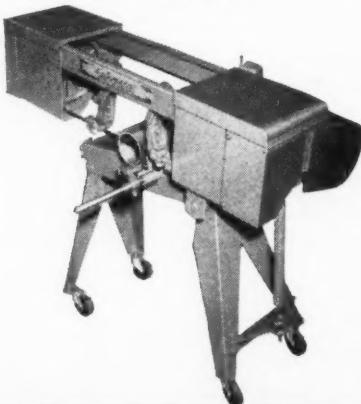
3 SIZES TO MEET YOUR REQUIREMENTS



On the right, Kalamazoo Model 610-S—fast, rugged, and accurate, with a host of exclusive features for finer performance. Takes rounds, tubes, and pipe up to 6" diameter, bars and angles up to 6" x 10". Outstanding low-cost saw on the market. Uses any standard motor $\frac{1}{3}$ HP, 110/60/1. Same capacity with coolant equipment as Model 610-C. Write today for complete information on any model.

Intermittent or continuous production cutting model—medium, large, or extra big capacity—you name it, Kalamazoo has it! 3 sizes in both standard and coolant models—a saw for every need.

On the left, the Kalamazoo 816-C (coolant model) takes up to 8" rounds, tubes, pipe; up to 8" x 16" bars and angles. Cuts them fast, smooth, accurately—with no burr, minimum kerf. Also available as Kalamazoo 824 standard or coolant models with 8" round capacity and 8" x 24" flat capacity.



MACHINE TOOL DIV. **Kalamazoo TANK and SILO CO.**

1022 HARRISON ST., KALAMAZOO, MICH.

Give Your Control Problems the AIR

INDUSTRIAL PRODUCTS DIVISION

WESTINGHOUSE
AIR BRAKE COMPANY
WILMERDING, PENNA.

Ideas for Engineers

Datair Sheet #5

EQUIPMENT: Cooling Water Sump Control

To Supply

H-3 Controlair Valve

Steam

Throttle

Steam Pump

Float

Sump Activator

A-2-H

APPLICATION: To proportion flow of recirculated cooling water to processing load

SOLUTION: Westinghouse H-3 Controlair linked to float in sump. Movement of float varies delivered air pressure from valve to Westinghouse A-2-H Activator, which positions itself accordingly, adjusting steam pump throttle

RESULT: Elimination of manual control—adequate cooling water under all rates of plant operation

Here's an example of how one smart Plant Engineer used WAB Pneumatic devices to inexpensively lick a continuous control problem. Our Engineering Data File shows many others. Your ingenuity will suggest ways you can adapt the ideas to solve some of YOUR problems. Write for a complete file for permanent reference. No charge.



INDUSTRIAL
PRODUCTS
DIVISION

WESTINGHOUSE
AIR BRAKE COMPANY
WILMERDING, PENNA.



Distributors throughout the United States . . . Consult your Classified Directory. Distributed in Canada by: Canadian Westinghouse Co., Ltd., Hamilton, Ontario

ARMSTRONG

TOOL HOLDERS



Equip with ARMSTRONG TOOL HOLDERS for Defense production

A change over to new products, starts in the tool room and the die shop . . . starts with ARMSTRONG TOOL HOLDERS. In preparing for defense orders, the logical first step is to check your stock of ARMSTRONG TOOL HOLDERS. With the correct types for every operation, and the correct sizes for each lathe, planer, slotter and shaper, you will be able to start work on a moments notice.

ARMSTRONG TOOL HOLDERS reduce "tooling-up" to the selection of a cutter and tightening of a set screw. They permit oper-

ation at higher speeds, and heavier feeds than are customary—they enable you to produce more pieces per hour, per man, per machine.

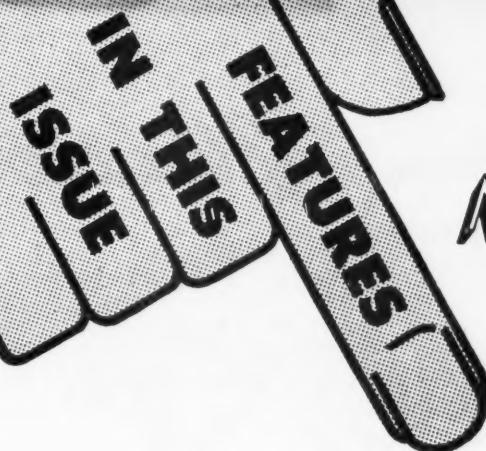
Produced by modern methods, in a specially-built tool plant, they are the lowest cost tooling you can buy. And, they are as available as your telephone for they are carried in stock by your local supply house.

Use ARMSTRONG TOOL HOLDERS wherever possible for lower tool cost, saving in High Speed Steel, increased output and greater profit. Write for Catalog.



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"
5228 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



MODERN Machine Shop

OCTOBER, 1951

Vol. 24, No. 5

Chrysler "FirePower" Engine Production

By Howard Campbell

A description of the more interesting machining operations involved in the production of the most powerful passenger car engines built by an American manufacturer. Page 124.

Sub-Zero Chilling as a Metallurgical Process

By Rolland S. Jamison

A review of current cold treating practice in which a wide variety of applications are described. Metallurgists especially will be interested in the advantages that the sub-zero chilling method has to offer. Page 140.

Thermal Distortion, Deflection and Vibration in Machine Tools, Part I

By Dr. Max Kronenberg

The first of a two-part article in which the author describes the study of thermal distortion, deflection and vibration insofar as these factors influence tool life, surface finish, working accuracy and maintenance of machine tools. Page 178.

Precision Routing

By Gilbert C. Close

This article describes the results of an investigation which was conducted by Northrop Aircraft, Incorporated, on routing methods. The results of this investigation point to a wider application of routing on minor jobs. Page 202.

Community Relations

By Bartlett West

This story describes the very well organized community relations program adopted by Caterpillar Tractor Company which has proved unusually successful in promoting better employer-employee relations. Page 222.

Faster Press Operations

By C. W. Hinman

In this article, Mr. Hinman focuses his attention on hydraulic presses which offer compactness and speed of operation on forming and assembling work of various kinds. Page 240.

American Society for Metals Congress and Exposition

Program of the National Metal Congress and World Metallurgical Congress to be held in Detroit, Michigan, October 13 through 19. Page 256.



Chrysler

By HOWARD CAMPBELL
Editor, MODERN MACHINE SHOP

LAST of the new lines of automobiles for 1951 to be unveiled was the Chrysler Crown Imperial, with its new eight-cylinder, 90-degree valve-in-head V-type engine. Rated at 180 horsepower, the new engine is known as the "FirePower", and is said to be lighter, more compact, more economical and more efficient than any previous engine of comparable piston displacement. It develops its full rated horsepower on ordinary grades of gasoline.

Despite the 33 per cent increase in horsepower, the efficiency of the engine is such that it is able to effect a saving of approximately 10 per cent in fuel consumption over the former Chrysler eight-cylinder engine. This high output is due to four fundamental features; namely, a hemispherical combustion chamber and lateral valve arrangement, superior manifolding, high valve lift, and high mechanical efficiency.

The machining of the parts for the FirePower engine involves the use of a number of interesting tools, some of which are presented here.

The machining of the spherical combustion chambers in the cylinder head is completed in one operation in the special machine shown in Fig. 1. The work-piece is automatically transferred into working position for machining the first and third combustion chambers; the chambers are machined, and the piece is automatically transferred to the second working position where the other two chambers are machined.

In order to produce a perfect hemispherical chamber in one cut, a special machine was built, designed upon the principle that if a plane is passed through a sphere and the segment is rotated about a fixed axis, a sphere will be generated. Four cutters are held in the end of a spindle which revolves in a spindle head. The spindle head revolves about a vertical axis with the cutters revolving about an inclined axis; thus the cutters pass through a vertical center-line. With the spindle rotating at a speed of 550 r.p.m., producing a cutting speed of 325 ft. per min., the spindle head is lowered to

FirePower Engine Production

Involves Some Interesting Tooling

depth and started rotating at a speed of 3 r.p.m., feeding at a maximum rate of 24 inches per min. and generating a spherical chamber in the cylinder head. The cutters are carbide toolbits. The illustration Fig. 2 shows the finished chambers.

After the valve stem guides and exhaust valve inserts have been assembled to the cylinder head, the valve stem holes in the guides and the valve seats are finished in the transfer machine shown in Figs. 3 and 4. Fig. 3 shows the complete machine; Fig. 4 is a close-up view of the tooling at one of the stations.

In the first station, the exhaust valve seats are generated and the valve stem holes in the guides are bored half way through. The workpiece is then transferred to the second station, where reamers, guided by the bored portions of the valve stem holes, finish-ream the holes to size. In the third and fourth stations the same operations are performed on the intake valve seats and guides.

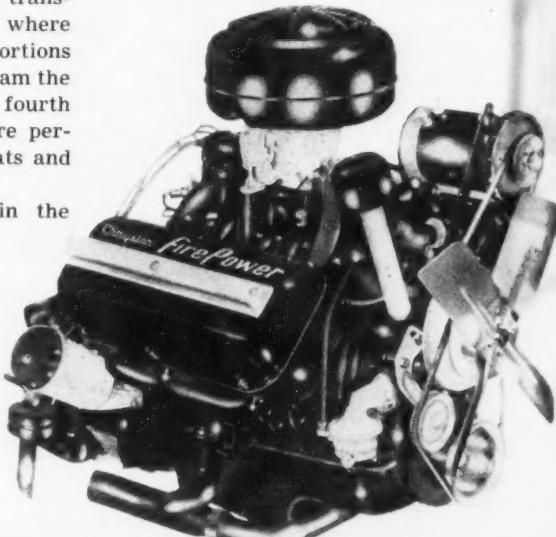
To be acceptable for use in the

Chrysler engine, the finished crankshaft must be in perfect balance. To find the point and amount of unbalance in a crankshaft, the shaft is placed in the cradle of an automatic balancing and drilling machine as shown in Fig. 5.

This machine consists primarily of a base and headstock, which are fixed, and an oscillating cradle. At the rear of the machine are mounted two drill units, each equipped with two spindles to accommodate one 1-inch and one 7/16-inch drill. The 1-inch drill is for standard use and the 7/16-inch drill is for cases where the unbalance falls outside the main cheek.

To balance the shaft, two of the flange holes are engaged with the driver studs and the machine is started. The

Most powerful passenger car engine built by any American manufacturer is this new Chrysler V-8 FirePower engine introduced this year on Imperial and New Yorker models. The engine has a compression ratio of 7.5 to 1, develops 180 horsepower, and is designed to give excellent performance with regular grade fuels.



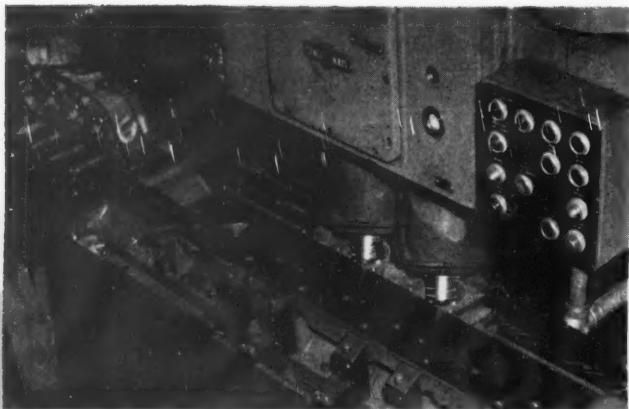


Fig. 1 — Machining spherical combustion chambers in cylinder head for Chrysler "FirePower" 180-h.p. engine, using a generating-type milling machine.

moved to compensate for the unbalance, and the other servo sets an angle pointer to indicate the degree at which stock should

amount of unbalance in each end of the shaft and the angular location of the points of unbalance are indicated by the hands on the instruments at the right of the spindles. At the same time two servomotors receive these signals and transform the readings into the correct machine settings for correcting the unbalance. One servomotor acts to set a cam to a position in which it will control the drill so that the correct amount of stock will be re-

moved. At this point the machine stops.

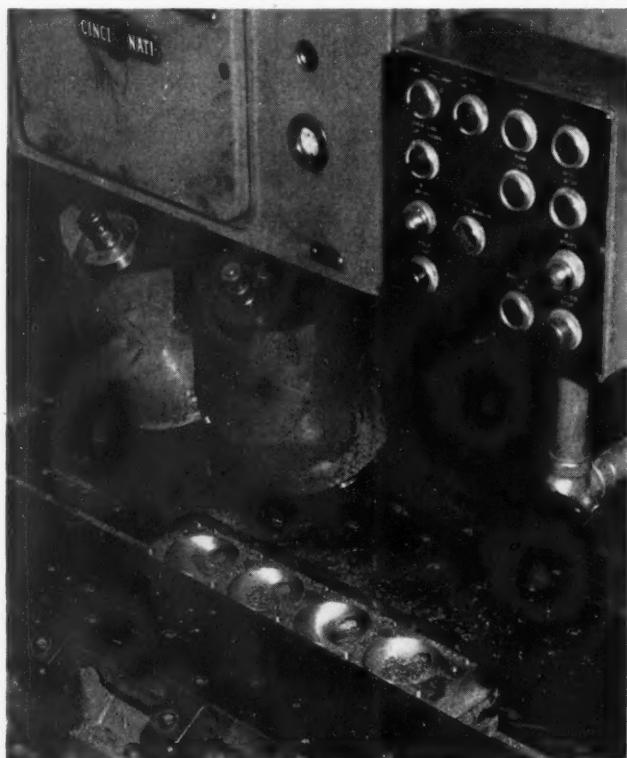


Fig. 2—View showing spherical chambers in cylinder head.

The operator now revolves the shaft by hand until location No. 1 is directly under the pointer, and presses a button. An air-operated lift raises the shaft some 0.010 inch above the support rollers, relieving pressure on the rollers. At this point an air-operated clamp en-

gages the shaft, the left drill feeds down and removes stock to a pre-set depth, stops and retracts, the shaft is lowered onto the rollers, and the shaft is ready for a check run.

The machine is now started, and if the shaft is within the required toler-

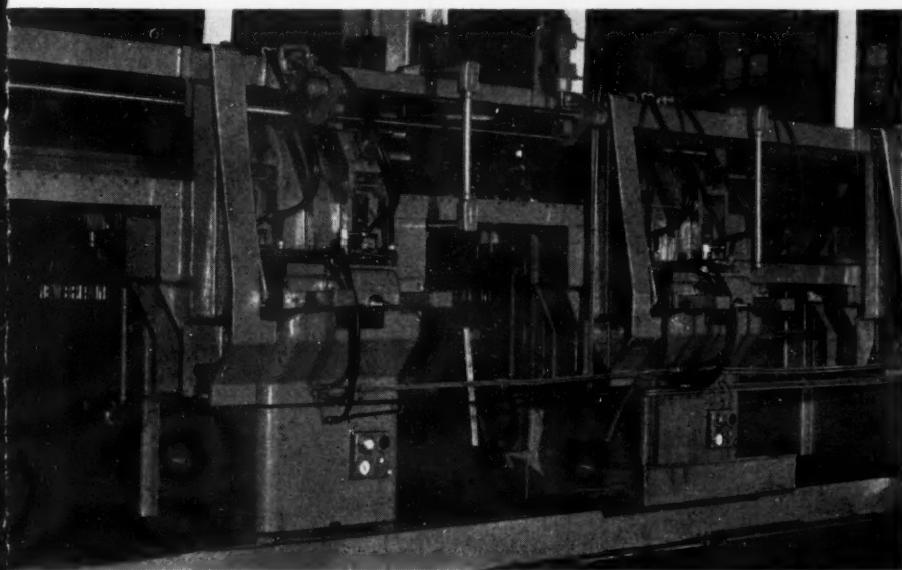


Fig. 3—Valve stem holes in guides and valve seats in inserts are machined, after assembling to the cylinder head, in this transfer machine.

gages the shaft and prevents it from revolving during the drilling operation.

The right-hand drill now feeds down, and as the drill-point strikes the crank-cheek, a contact is automatically set to follow the drill and engage the cam when the drill is at the correct depth. When the contact reaches the cam, the drill stops and returns to its top position and the clamp releases its grip on the shaft.

The operator now revolves the shaft to position No. 2, for the left end, and pushes another button. Again the clamp

engages the shaft, the left drill feeds down and removes stock to a pre-set depth, stops and retracts, the shaft is lowered onto the rollers, and the shaft is ready for a check run.

If the point of unbalance is located outside the main counterweight, it is so indicated by the angle servo-unit, telling the operator that he must use the auxiliary drill. The 1-inch drill is

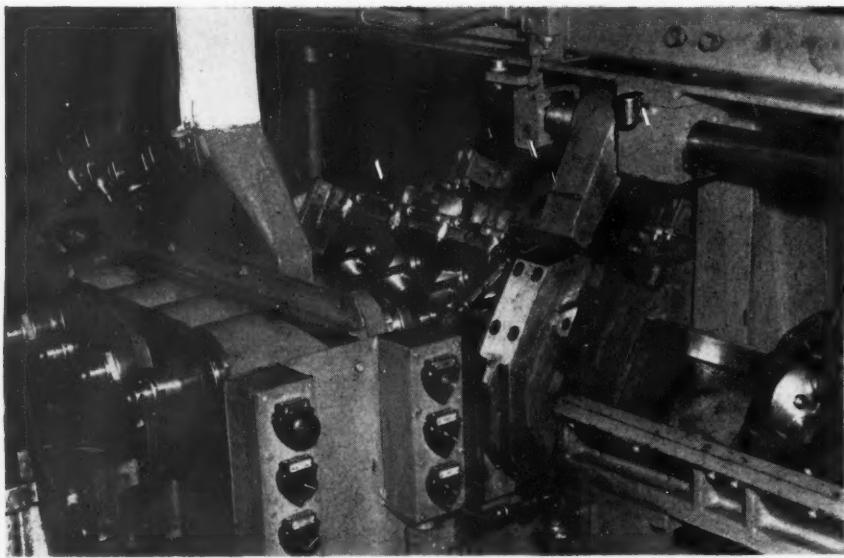


Fig. 4—Close view of mechanism of machine, showing tooling.

then removed and the 7/16-inch drill is used to remove the surplus stock from the narrower adjacent cheek.

Pr^ovision is also made for a third signal to be given if the unbalance is so great that drilling one hole to its greatest permissible depth will still come short of removing all the stock necessary to balance the shaft within the required tolerance. In such case, the

depth servo will set itself for a new depth based on the effect of two drilled holes to be located a few degrees off center on each side of the indicated angular location.

The operator has little interest in the meter readings, since the servo-units receive the signals and translate the readings into cam setting for depth and pointer setting for angle. The meters

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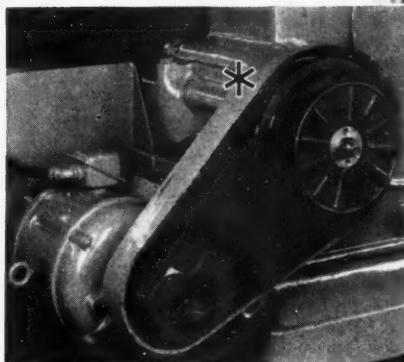
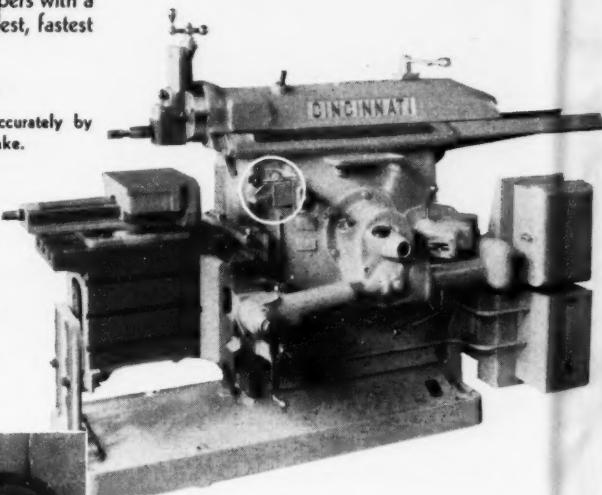
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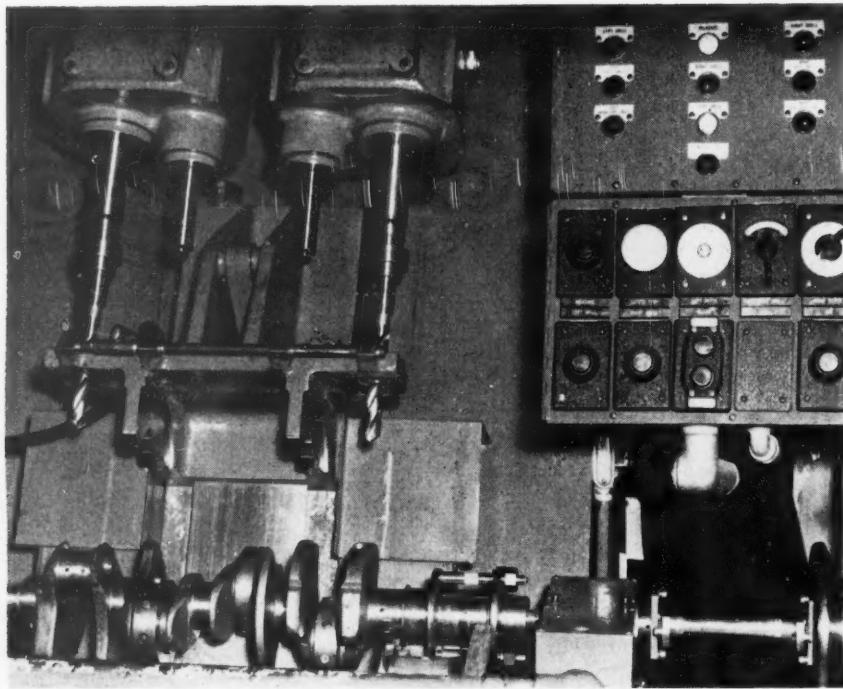
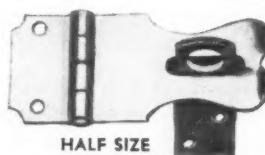


Fig. 5—Chrysler crankshafts are tested for balance, the point of unbalance is determined, and the excess metal is drilled out in this balancing and drilling machine.

are necessary, however, when the machines are to be checked or calibrated for accuracy.

Pistons are finish turned and the wristpin holes are finish bored in a spe-

cial machine as shown in Fig. 6. The fixtures for holding the pistons are mounted on a three-position trunnion, and each piston is held in position by means of three clamps, as shown in Fig.



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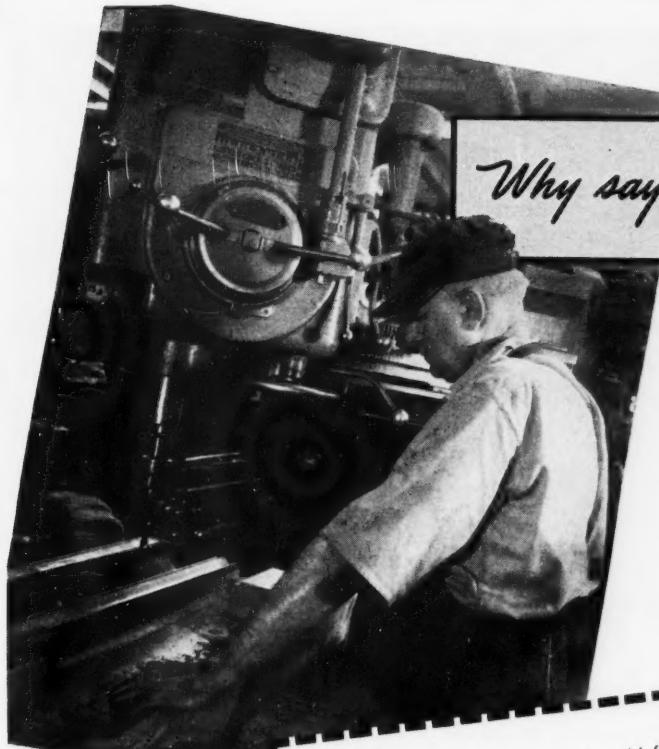
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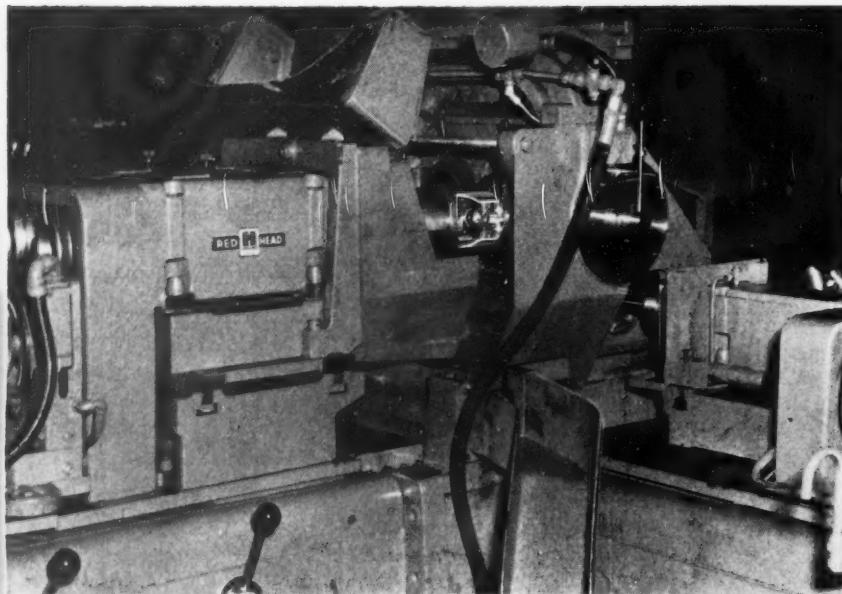


Fig. 6—Pistons are finished turned and wristpin holes are bored simultaneously, using a three-position trunnion fixture.

7. Each piston is positioned head downward and is located centrally by means of a spring center. The radial location is obtained by means of a hinge locator that carried locating pins which register in the holes in the weight bosses.

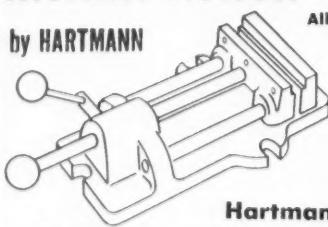
The pistons are clamped in the fixture as shown in Fig. 7, then indexed to the second position, where they are fin-

ish-turned, then indexed to the third position, where the wristpin holes are finish-bored. No other finishing operations are performed on these surfaces except tin plating.

The operation of the machine is entirely automatic except for loading and unloading. The pistons are turned to within 0.0003 inch of specifications; the

INSTANT ACTION

by HARTMANN

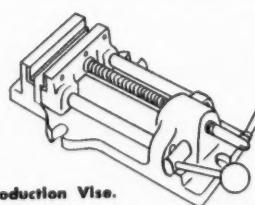


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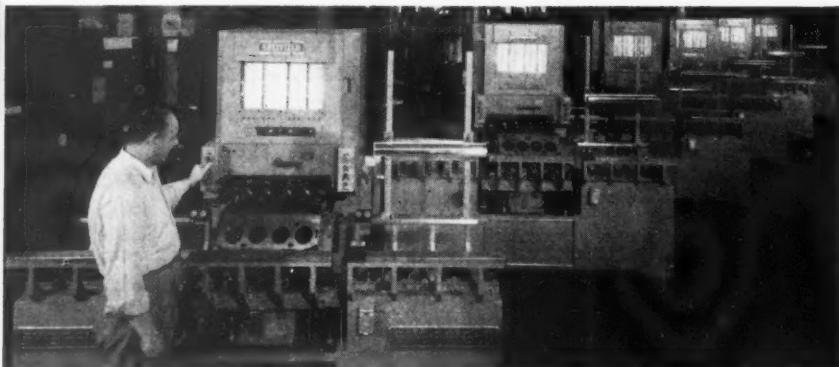
Fig. 7—Close-up view of trunnion fixture showing pistons in loading position and, below, pistons in position for operation of boring wristpin holes. The turning operation is in the rear.

wristpin holes are bored to within limits of 0.0003 inch. The machine op-

Illustrations Courtesy Chrysler Corporation

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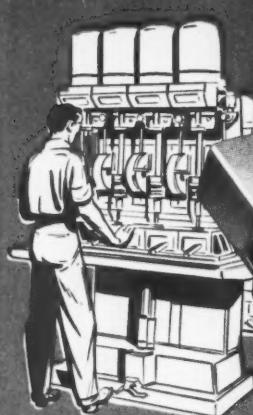
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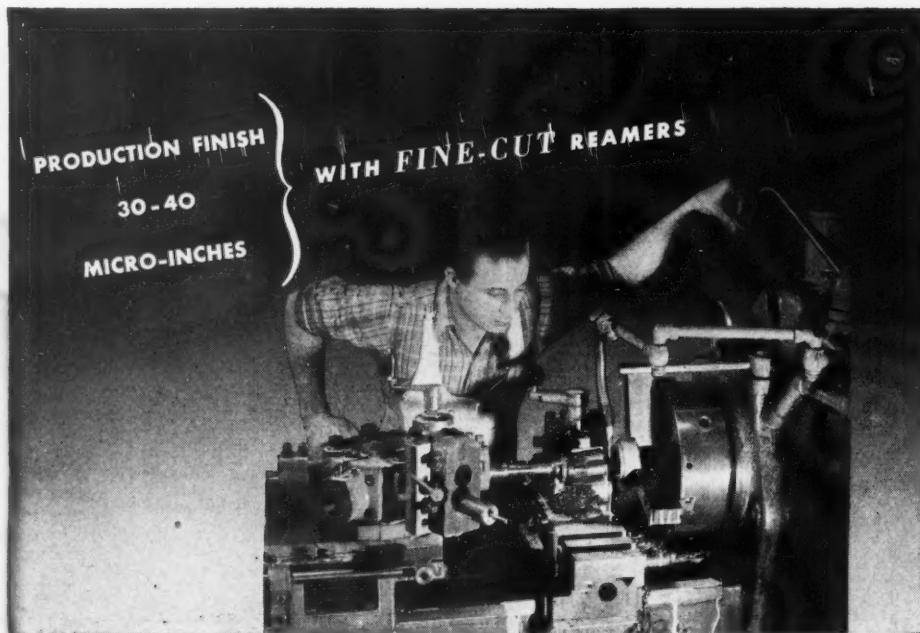


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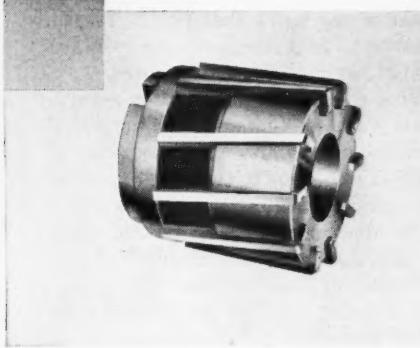
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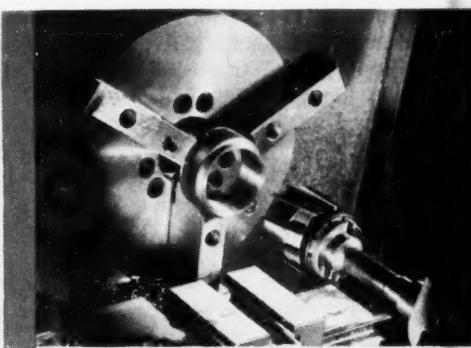
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Sub-Zero Chilling as a Metallurgical Process

By ROLLAND S. JAMISON

Sales Engineer, Sub-Zero Products Division, Deepfreeze Distributing Corporation

THE industrial cold treating process, as it exists today, is a product of the scientific ingenuity of the twentieth century. Beginning as a laboratory experiment several decades ago, it has developed rapidly over the years until, today, it occupies a definite place in many types of industrial production.

While early experiments disclosed that changes did take place in metals subjected to cold treatment—namely, greater hardness and uniformity of structure—none of the early investigators knew exactly what took place. The microscope was the only instrument available with which to study the results, and it proved nothing conclusively. With the advent of magnetic and size measurement, increased hardness

values were noticed along with magnetic improvement and size growth.

Some concern was voiced as to whether the cold treating process, by increasing the hardness of tool steel, would make it too brittle. This concern was dispelled as a result of impact tests which showed that ductility is improved when work that has increased in hardness as a result of cold treating is retempered to standard values.

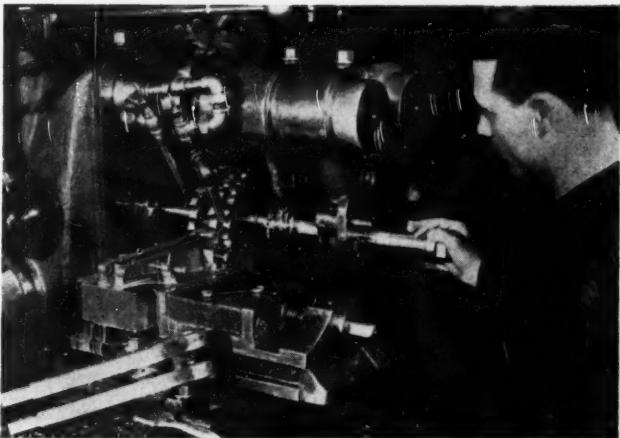
From this beginning, further experiments were conducted over a period of years on other alloys. The results were satisfying but, due to the lack of a suitable chilling medium, the process could not be applied commercially. Not until the appearance of mechanical chilling machines, in their present form, was cold treating applied productively to metals and other industrial products.

The scope of the cold treating process will continue to expand with time. In addition to the many established uses to which it is presently applied, it will be found applicable to many other



Form cutter of 18-4-1 tool steel used by Massey-Harris, Racine, Wis., to form a complete tooth section on a differential side gear. Work material, SAE 4820; Brinell, 387. Best performance of tool before sub-zero chilling treatment, 150 pieces in 6 hrs. Average performance of tool after 2 hrs. at -120 deg. F., 510 pieces in 6 hrs.

Set-up with two cold-treated 8-in. cutters and one cold-treated 9-in. cutter for milling four faces on yoke lever. Material, SAE 4340; 386-407 Brinell. Cutter life increased by chilling treatment from 7 hrs. to 24 hrs. continuous operation.



tasks, some of which are yet in the experimental stage. Many metallurgists predict that, in the near future, every up-to-date hardening room will be equipped to apply cold treating as a supplement to the regular heat treating procedures.

Hundreds of manufacturers of as many different types of products are using the cold treating technique today as a production operation. Where the operations include the use of certain alloys of hardenable materials, cold treating is used to increase the hardness and improve the uniformity of structure of the metal. In the manufacture of gages, precision instruments or tools, or other products where extreme accuracy must be maintained, the processing necessary to maintain such accuracy can be done by cold treating in a fraction of the time required by traditional aging procedures.

Where the "heat and press fit" method was formerly in use in assembly operations, the replacement of this method by cold treating has increased the speed, safety and economy of the operations. In the production of units or parts that will be subjected to frequent temperature changes of extremely low temperatures in service, the cold treat-

ing technique is applied for testing purposes to predetermine the action of the products under service conditions.¹

To those who are unfamiliar with the cold treating process, the equipment looks about the same as the ordinary food freezer. However, there are important differences both in the mechanical units and in the construction. As an example, the industrial unit built by the Sub-Zero Products Manufacturing Division, Deepfreeze Distributing Corporation, is insulated with "fluffed-up" Santocel, a product of the Monsanto Chemical Company.² Also, the unit is equipped with two compressor units instead of one.³

The most important advantage of these features consists in that, instead of the 20-below zero temperature limit

¹ Also, tool steel parts, which grow and warp when subject to these extremely low temperatures are stabilized before the finish grind. The parts then will remain stable and will not fail as a result of dimensional changes.

² Which has an insulating effect 2½ times the next best known insulation.

³ To allow conventionally designed compressors to operate at normal pressures at extreme low temperatures. The compressors are in cascade relationship.



Cutting guide slot with cold treated slotting tool. Material, SAE 4340; 387-407 Brinell. Slotting tip made from scrap 18-4-1 tool steel. Tool produced 3 to 12 slots. Changed to carbide-tipped tool that produced 25 to 52 slots, but tool chipped from impact shock. Changed back to original 18-4-1 that had been treated 2 hrs. at -120 deg. F. Tool produced an average of 119 slots.

of the food freezer, the industrial chilling machine can operate down to 150 deg. F. and maintain that temperature consistently.⁴

The industrial chilling machine is adaptable to several important industrial applications, such as (1) shrinkage of metals for fitting and assembling, (2) stabilization and stress equalization of hardened steel tools or parts, (3)⁵ and (4) testing of aircraft instruments and materials.

The testing of instruments and materials is one of the more recent developments in the application of the Sub-Zero chilling technique. Today, with modern aircraft flying at altitudes ranging from 30,000 to 50,000 feet, temperatures as low as -60 to -70 deg. F. are encountered. It is necessary, therefore, that the many precision aircraft parts and instruments function normally at these low temperatures.

⁴ Without loss of thermal capacity.

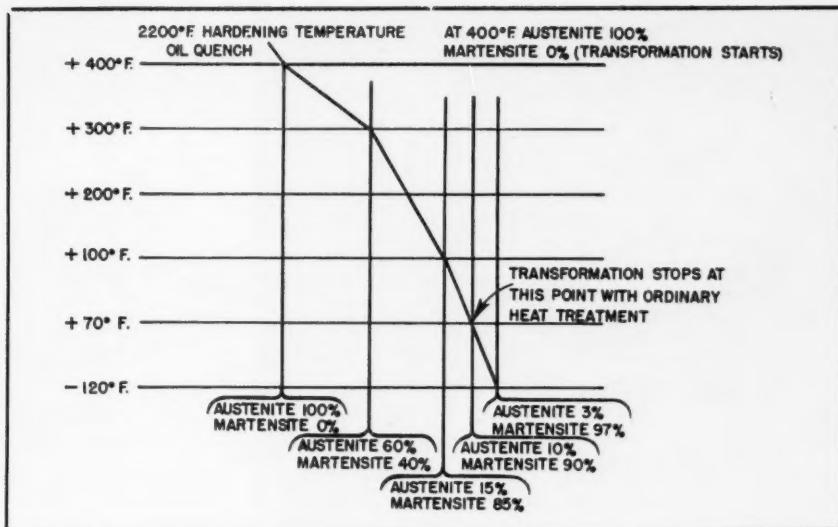
⁵ This is an application which -20° F. will handle—(3) Further transform Austenite to Martensite thus, giving longer life to perishable tools.

For instance, all vital aircraft instruments must be capable of functioning accurately; rubber parts must retain their flexibility so that they do not become brittle and break, and engine lubricants must operate freely. The use of sub-zero temperatures for testing these parts has resulted in many new developments in metals, plastics, rubber and other materials which will be invaluable in modern production. The adaptation of the chilling unit for such testing is comparatively simple; for instance, the Sub-Zero -120 deg. F. machine is converted for this work by installing a 2-inch herculeum glass cover with vacuum take-off tubes, hydraulic tubes and thermo-couple connectors passing through the glass.⁶

Shrinking of Metal

Among the important applications of Sub-Zero temperatures in plants today is the practical use of its shrinking effect on metal to provide a simple, fast method of assembling parts. In most cases it is not necessary to resort to excessive or injurious heating of the fe-

⁶ Stabilization of steel parts of special alloys is vital on such high altitude aircraft to prevent dimensional change when exposed to the extreme low temperatures.



The above chart was developed by a prominent metallurgist to show the curve of transformation of Austenite to Martensite in high speed steel at temperatures varying from +400 deg. F. to -120 deg. F.

male parts to provide a perfect assembly.

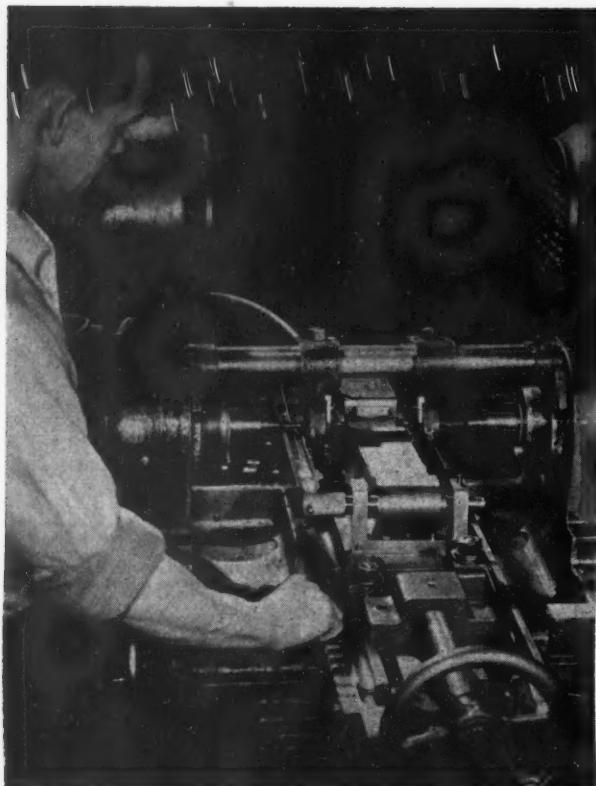
Shrinking of metal at -120 deg. F. to -150 deg. F. with sub-zero chilling equipment has made it possible to assemble sleeve bearings and ball or roller races otherwise requiring a press-fit, by merely slipping them into position after chilling. Shrink-fit application usually involves the chilling of the inserted part only, although some practices call for heating the female part slightly and chilling the mating section. In most cases it is possible to insert the male part by hand with a tight fit resulting as soon as the part has returned to room temperature. This eliminates spoilage of expensive bearing and races and out-of-roundness and misalignment caused by excessive pounding on the bearings during assembly by previous methods.

Advantages of Chilling for Shrink-Fit Assembly

One of the advantages in chilling parts that are to be assembled by the "shrink-fit" method is that there is less possibility of altering the characteristics of the metal by the chilling method than by heating. There is also less possibility of distortion of parts which have sections of various sizes when the chilling method is used. A definite advantage on the assembly floor consists in that chilled parts can be handled with greater ease than heated parts. Finally, when the chilling method is used the hazard of oxidation is eliminated and no finishing operation is necessary to remove oxidation.

Treatment of Tool Steel

The sub-zero chilling process is finding wide application in the treatment



Set-up for drilling four holes in yoke lever with cold-treated tools. Material, SAE 4340; 387 to 407 Brinell. Operation: drilling 11/32-in. holes 1 $\frac{1}{4}$ in. deep. Tools: Latrobe High Speed Steel Drills. Originally produced 48 holes per grind. After 2 hrs. treatment at -120 deg. F., drills produced 256 holes per grind.

of metals at -120 deg. F. to -150 deg. F. The purpose of such treatment of metals is the "conditioning" of the steel to produce combinations of greater hardness and strength and to improve ductility. In addition, a more complete transformation of Austenite to Martensite can be obtained which helps to relieve internal stresses and strains and produces a more uniform hardness.

Laboratory tests reveal that temperatures colder than -150 deg. F. are unnecessary in the cold treatment of high-speed steel. Temperatures warmer than -100 deg. F. are relatively ineffective. Therefore, temperatures ranging be-

tween -100 deg. F. and -150 deg. F. obtained with the modern industrial chilling machines are ideal for the proper treatment of steel.

Seasoning Gages and Tools

Another valuable application of metal chilling is its use by tool and gage manufacturers for seasoning, setting, and counter-annealing

gages, arbors, mandrels, and so forth. The purpose of such treatment is to insure dimensional stabilizing of the steel which prevents permanent deformation of the parts due to aging. It is possible with chilling to secure the same stability of steel in a few hours that formerly took years in some cases.

This quick-aging of steel eliminates costly metal growth and warp by holding the finished size under all normal temperature changes and handling. The lapping plates and surface plates used in the manufacture of gage blocks are also stabilized in chilling equipment. By chilling, these plates will re-

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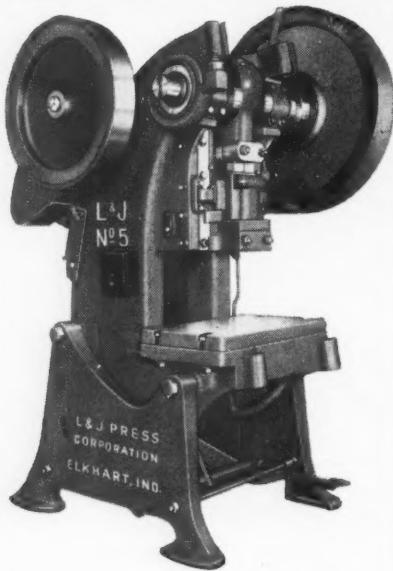
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tain their accuracy for two or three days, whereas formerly it was necessary to resurface them every two or three hours.

Testing of Metal and Materials

One of the newer, but equally important, applications of sub-zero temperatures is the testing of instruments and materials, particularly in the aircraft industry. Delicate aircraft operating instruments, engine lubricants, radio receivers and transmitters, cameras, rubber goods, including oxygen masks, plastic and metal construction materials, or any other part that may not function when it is subject to low atmospheric pressure or cold temperatures, are all tested in conditions equivalent to those found at maximum flying altitudes.

Other Miscellaneous Uses

In addition to the many uses described above, sub-zero chilling units are finding many other money-saving applications in a wide variety of industrial fields. Among the industries where low temperature techniques are speeding and improving production methods are; metallurgy, chemicals, pharmaceuticals, plastics, petroleum, paint manufacture, instrument testing and assembly.

The improvement in the cutting efficiency of high speed tools by the use of sub-zero chilling employed as a heat treating process has made phenomenal progress in the past few years. The process has been of sufficient importance to interest research divisions of our top technical colleges in studying the structural changes that occur. At the same time the process is so simple that it can be employed by any user of high speed steel. A brief review of what



Sub-Zero Model R-120
Removes 2000 BTU
per hour at 120
degrees below zero F.

"QUICK- AGE" STEEL

with sub-ZERO chilling

- stop growth and warp!
- get complete stabilization in minutes!

Absolute stabilization of steel, ordinarily requiring years of seasoning, can be completed in minutes by Sub-Zero chilling.

Here's how: steel to be treated is given repeated cycles of drawing and Sub-Zero chilling to -120° F. This cycling of heating and chilling effects a 100% transformation of austenite to martensite. The cause of dimensional change is thus eliminated, and growth and warp is stopped. The complete dimensional stability—that formerly required years of seasoning, is obtained in minutes by Sub-Zero chilling.

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For full details on stabilization by
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Remember: Sub-Zeroing
increases perishable tool
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KEY-WAYED Arbor Spacers in 20 arbor diameters (from $\frac{3}{8}$ " to 4") and 19 graduated thicknesses (.001" to .125") are available in plainly marked tough transparent envelopes. Specials over .125" thick are available in popular arbor sizes and thicknesses, machined from bar stock, hardened and ground, with standard key-ways, identified as to thickness. • For speedy set-ups ask your industrial Distributor for "DE-STA-CO" by name, or send for Arbor Spacer Size and Price List. Quantity Discounts apply to bulk purchases of given sizes and thicknesses.



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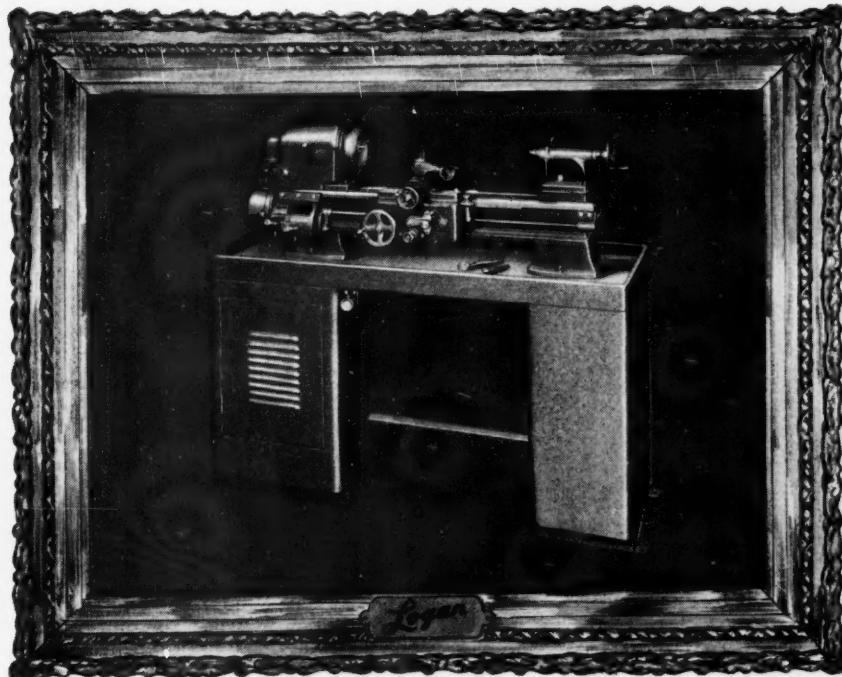
has been done up to the present time is in order.

The cold treatment of high speed steel may be applied either after conventional hardening, tempering, and grinding or incorporated in the hardening and tempering cycles. The preferable method is to employ the cold treatment during the hardening and tempering process. Stock tools that are hardened and finished ground may be treated and definite cutting efficiency improvement expected.

Stock tools that are heat treated and ground to finished dimensions may be subjected to a temperature of —120 deg. F. for a period of from 3 to 6 hours, depending upon their cross-section size. This treatment is carried out in the low temperature industrial chilling equipment manufactured by the Sub-Zero Products Manufacturing Division, Deepfreeze Distributing Corporation, Cincinnati, Ohio.

The design of a cutting tool made of high speed steel will determine the method of applying the cold treatment. Large sections, very sharp corners, and a high cobalt content are determining factors in anticipating hardening cracks. A tool so designed that these factors are not encountered can be cooled to low temperatures directly from the hardening heat. An alternative practice to save a tool having irregular design or hazardous analysis is to temper before applying a sub-zero treatment and re-temper after the tool has been returned to room temperature.

The procedure used in cold treating 18-4-1 high speed steel, cobalt bearing high speed steels, and the molybdenum high speed steels is the same for each of the above mentioned steels. However, the proper pre-heating and hardening temperatures recommended for each



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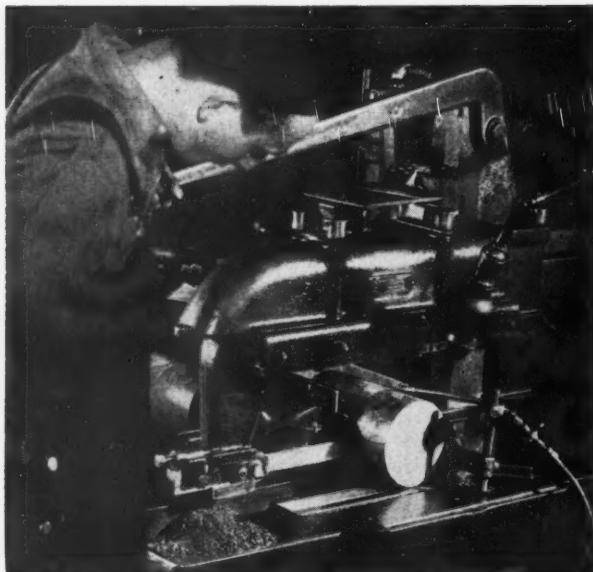
keep production going at top efficiency. With 11" swing and 1" collet capacity they handle a big percentage of any shop's work. Rugged as well as accurate, they are lathes you can depend on, not only the first year, but for years after. Remember, too, that no other lathe of comparable specifications can match the Logan in economy.

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Using Lennox Moly high speed steel saw blade to cut 5½-in. round Meehanite cast bar. Life increase after 2 hrs. sub-zero chilling treatment, 119 per cent.

one by the manufacturer of the steel should be used.

Experiments with the sub-zero chilling method of hardening high speed tool steels have shown that only a small amount of transformation of the retained austenite occurs below —120 deg. F. and that it stops below —150 deg. F. Consequently any readily attainable temperature within the range of —120 deg. F. and —150 deg. F. may be used.

During the continuous cooling of high speed tool steels from the hardening temperatures of 2350 to —150 deg. F., the austenite transformation sets in at 420 deg. F., progresses smoothly through room temperature, and stops at approximately —150 deg. F. If the steel is interrupted in the cooling from 2350 deg. F. at room temperature as is done in the ordinary oil hardening operation, the transformation stops.

The manner of cooling through room

temperature and then transfer to the chilling unit when the steel reaches a temperature of 100 — 200 deg. F.

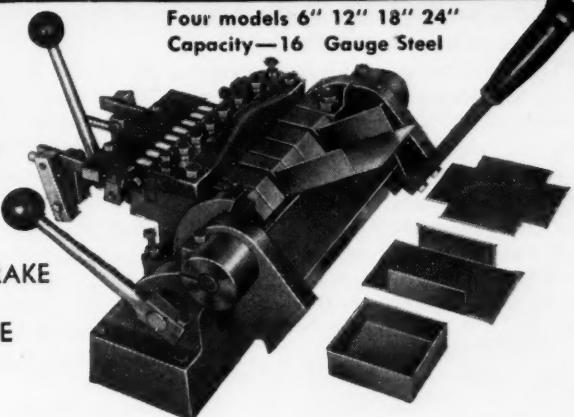
The rate of sub-zero cooling and the time of holding in the chilling unit have no measurable effect on the extent of the sub-atmospheric transformation. If the hardened steel is tempered at temperatures of between 200 and 875 deg. F., the retained austenite is stabilized sufficiently so that no transformation occurs during subsequent cooling in the chilling unit. However, tempering above 875 deg. F. produces enough carbide precipitation from the retained austenite to lower its stability to the point where the transformation again takes place during cooling from the tempering temperature to the temperature of the chilling unit.

Tempering the steel after sub-zero cooling completes the retained austenite transformation. Thus the sub-zero chilling method of hardening high

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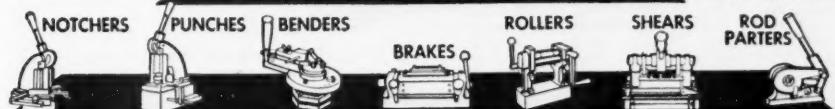
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speed tool steels follows the same fundamental procedure as tempering after ordinary hardening.

The increment of hardness developed in the hardened steel by sub-zero cooling is persistent during tempering up to temperatures as high as 1050 deg. F. The combination of sub-zero temperature hardening and proper tempering treatment of high speed steels will result in combinations of hardness, strength and ductility unattainable by ordinary hardening and tempering. It has been reported on excellent authority that sub-zero treatment of high speed steel permits higher cutting speeds when working with short chips and that the interval between regrinds is considerably increased.

The three general procedures now in use are as follows:

Procedure 1.

A. Preheat 1400-1550 deg. F., depending on analysis. (Double preheating is

recommended, using 700-1000 deg. F. first.)

B. Heat to hardening temperatures, depending on analysis. (2100 deg. F. to 2400 deg. F.)

C. Quench in oil, lead, salt or air.

D. Remove from quenching medium at approximately 200 deg. F. and transfer to tempering temperature.

E. Temper 2 to 4 hours to hardness specification. (1000 deg. F. minimum.)

F. Allow tool to cool to 150 deg. F.

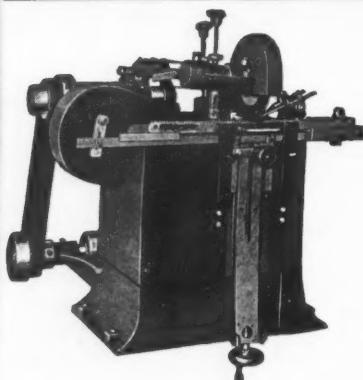
G. Cold treat to -120 deg. F. in sub-zero chilling machine for 3 to 6 hours, depending on cross section size.

H. Allow part to warm to room temperature normally.

I. Repeat tempering cycle, using 25 deg. lower temperature for 2 to 4 hours.

Procedure 2.

A. Preheat as above to 1400 to 1550 deg. F. (Double preheat whenever possible.)



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The only single unit grinder adaptable for hack, band and circular saws that does not depend on the shape of the grinding wheel to form the shape of the tooth. This unique feature enables operator to grind a variety of blades without dressing or changing wheels.

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B. Heat to hardening temperatures of 2100 to 2400 deg. F. depending on analysis.

C. Quench in oil, lead, salt or air.

D. Tool can air cool if removed from quenching mediums at higher temperatures to 150 deg. F.

E. Transfer to sub-zero chilling unit at —120 deg. F. for 3 to 6 hours, depending on cross section size.

F. Allow to return to room temperature.

G. Temper to specified hardness.

H. Transfer to sub-zero chilling unit at —120 deg. F. when tool has cooled to approximately 150 deg. F. from the tempering temperatures.

I. Remove from sub-zero unit and allow to return to room temperature.

J. Re-temper at 25 deg. lower than original tempering for 2 to 4 hours.

Procedure 3.

During the past year experiments

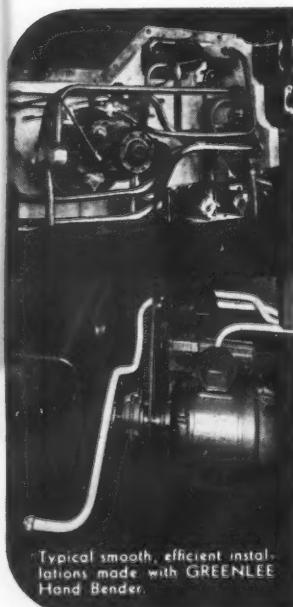
giving satisfactory results have been carried out by simply heat treating the tools as usual, grinding them to finished tolerances and then applying a sub-zero treatment for 3 to 6 hours at 120 deg., F. below zero.⁷

The following is an accurate record of result, indicating the increased efficiency of cutting tools that have been given sub-zero treatment as outlined in Procedure No. 3.

1. Standard drills 11/32 inch in diameter drilling holes 1 1/4 inch deep in S. A. E. 4340 steel at 387-407 Brinell drilled an average of 256 holes, versus an average of 48 holes when not cold treated.

2. Standard milling cutters mounted in a gang of three, machining the same

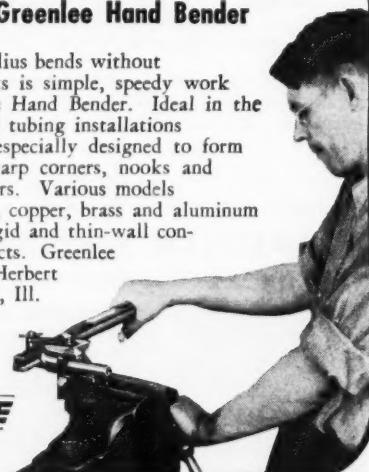
⁷ The tool is then given a light draw (300 deg.). The chilling and drawing cycle are repeated from 2 to 4 times ending with the draw. The tool is then ready for use.

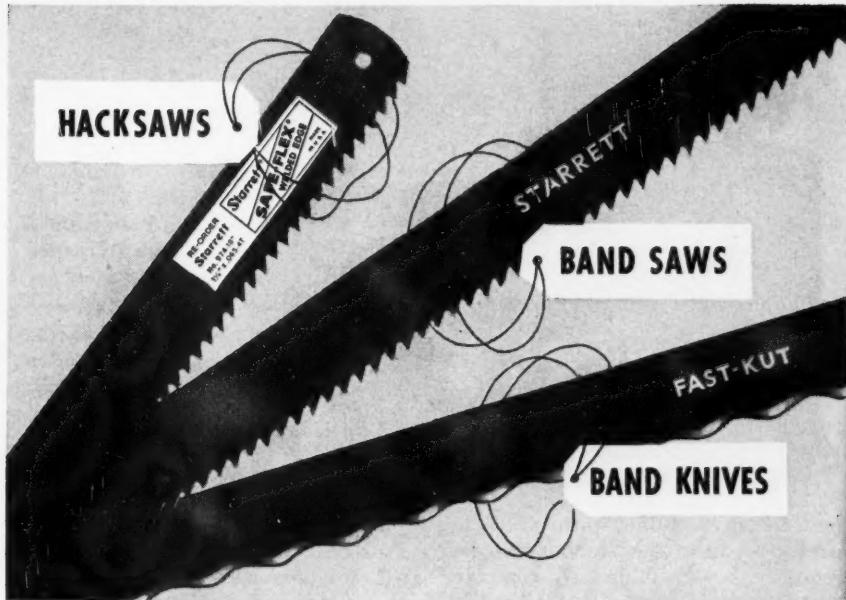


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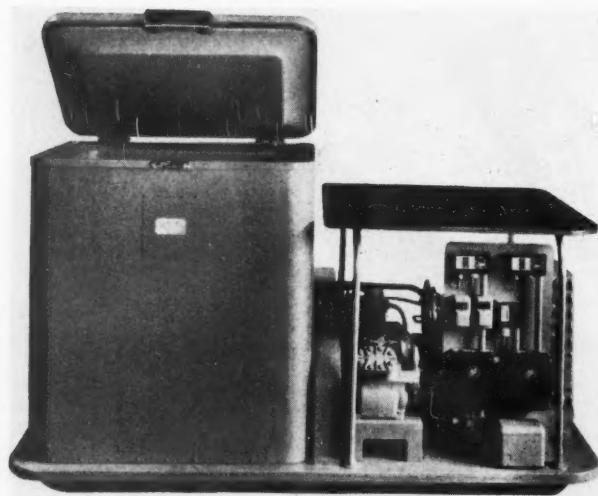


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material as mentioned in the preceding paragraph have run 24 hours without requiring re-grinding as compared with 7 hours for cutters not cold treated.

3. Molybdenum high speed steel hacksaw blades, after chilling, have lasted more than twice as long as before the cold treatment.

4. Gear cutting hobs used in the making of differential gears have shown an increase of from 150 pieces per grind to 510 pieces per grind.

5. On a tapping operation, the average life of taps was 40 pieces; lots of cold treated taps averaged 710 pieces.

6. Cold treated high speed steel burnishing broaches showed an average increase in life of from 216 to 648 pieces.

The hardness of cutting tools may increase perceptibly if the original tempering operation had been incomplete, and should an extremely high hardness develop, it is recommended that the tools be re-tempered to usual hardness working ranges.

Cold Treatment of Water Hardened Die Steel

The following method is that found best adapted for cold treating water hardened die steel.

1. Heat to 1500 deg. F. (Or usual method).
2. Quench at 75 deg. F. (Or usual method).
3. Immerse at once in chilling unit at —120 deg F.
4. Draw as usual (if drawing temperature exceeds 875 deg. F., then again immerse in chilling unit at —120 deg. F.)

Cold Treatment of Rex M. M. High-Speed Tool Steel

For the treatment of Rex M. M. High-Speed Tool Steel, the following procedure has been successfully used.

Heat Treatment (Ordinarily Used)

Pre-heat	1550 deg. F.
Hi-Heat	2160 deg F.
Quench	(air)
Draw	1025 deg. F. (2 hours)
Cool to room temperature	
Draw	1025 deg. F. (2 hours)

Rockwell showed 63-64 C.

Heat and Cold Treatment (Chilling Method)

Pre-heat	1550 deg. F.
Hi-Heat	2160 deg. F.

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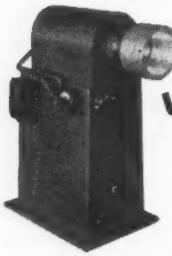
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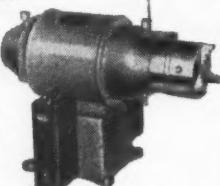


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Quench (air) to +120 deg. F.

Chill to -120 deg. F. for (3 hours)

Warm to atmosphere in air

Draw 1025 deg. F. (2 hours)

Cool to +120 deg. F.

Chill to -120 deg. F. (3 hours)

Warm to atmosphere in air

Draw 1025 deg. F. (2 hours)

Cool to +120 deg. F.

Chill to -120 deg. F. (3 hours)

Rockwell showed 65-67 C.

NOTE: If the Draw is permitted to go over 1025 deg. F., it will be necessary to repeat the sub-zero chilling process.

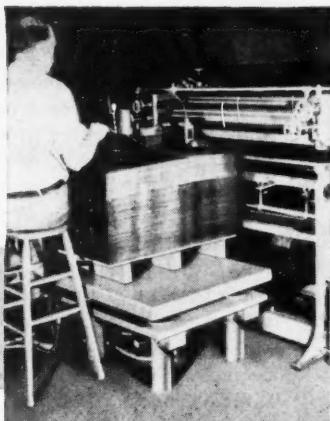
Cold Treatment of Finished Products, all Types Steel

For the cold treatment of the finished product not manufactured by the user, the following procedure is successfully used by many firms with chilling equipment.

1. Heat to 300 deg. F. in tempering furnace (if furnace is not available use boiling water at 212 deg. F.)
2. Cool to atmosphere
3. Immerse in chilling unit at -120 deg. F.
4. Warm to atmosphere.
5. Repeat cycle 5 to 6 times.

Stabilization of Metals by Cold Treating

The stabilization of gages, arbors, mandrels and other precision machine parts is another important use to which cold treating is being put by many manufacturers. Its prime purpose is to complete the transformation of the retained Austenite and thus prevent the dimensional changes which would otherwise occur in the steel over a period of time. So great is this change that gage blocks have been known to increase as much as twenty times the given tolerance.



Previous to installation of the automatic, self-leveling **Portelvator Pack-lifter**, the sheet feeding operation shown here was performed from a standard four-wheel floor truck. This involved stooping and lifting, and resulted in unused machine capacity. Application of **Portelvator** Material Positioning Equipment increased daily production to such extent that installations were made at 6 additional locations.

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The guy has a grip like a JACOBS CHUCK!"*

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IT HOLDS

The Jacobs Manufacturing Co., West Hartford 10, Conn.

In the past, this dimensional change has been overcome by partially finishing the product and then allowing it to age out-of-doors over a period of several years. This aging process satisfactorily accomplished the desired end, but the time element involved made it impractical for high-speed production.

Laboratory experiments have proved that the stabilization of steels could be made both practical and productive by subjecting the parts to alternate treatments of heat and cold in mechanical refrigerating units. As a result of this information and through the use of sub-zero chilling machines, a job that formerly required years can now be accomplished in a few hours.

In addition to using cold treating to stabilize all types of close tolerance gages, gage manufacturers are also using it to stabilize the lapping flats that are used in the manufacture of gage blocks, thereby increasing the retained plate accuracy from a few hours to several days. This eliminates the constant resurfacing of these plates that was formerly required. Cold treating is also being used to stabilize close tolerance machine parts. This application, although relatively new, is being used extensively because of the outstanding results that many machine tool manufacturers have obtained by cold treating parts such as divider heads, lead screws, machine ways, bearing parts and other precision parts.

It has been found that cold treating for the purpose of stabilization also results in an increase in the wear-resisting qualities of the part being treated because of the increased hardness resulting from cold treating.

Several of the most important stabilization procedures in use today are included here.

PRODUCTO

DIE SET

AIDS
WHITNEY CHAIN
COMPANY...



WITH HEAVY DUTY PRODUCTION JOB !

The progressive 4 pin Producto Die Set shown provides the accuracy and ruggedness required to emboss, pierce and blank Pin Link Plates for Whitney Roller Chain Drives... 2' at a time... on a Niagara press.

OPERATIONS

Station No. 1 — Whitney Chain markings are clearly embossed for each link.

Station No. 2 — Four holes, two to a link, are rough pierced.

Station No. 3 — Two chain links are blanked out on each press stroke.

TOLERANCES

Hole diameter $+.0005"$ $-.0005"$

Hole centers $+.001"$ $-.001"$

Link Contour $+.005"$ $-.010"$

PRODUCTION RATE

153,000 links blanked per 40 hour week.

Between grinds, 75,000 pieces.

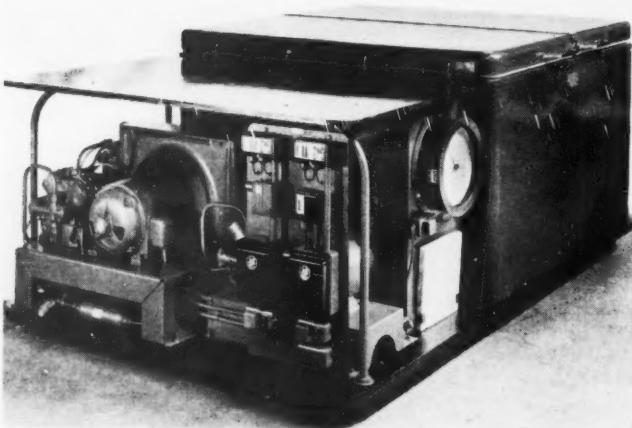
MATERIAL

$\frac{1}{4}$ " thick SAE 3140 hot rolled steel in coiled stock.

Buy Producto Special and Catalog Die Sets... play safe when performing heavy duty stamping operations.

THE PRODUCTO MACHINE COMPANY
910 Housatonic Ave., Bridgeport 1, Connecticut

ALSO MAKERS OF TOOL AND DIE ACCESSORIES, VISES, MACHINERY
SPDSI



Model R-120 Sub-Zero
Chilling Machine with
Special Chilling Chamber
designed for chilling
bearings up to 49
in. diameter. Bearings
are treated horizontally.

In the widespread use of cold treating to stabilize metals by effecting a complete transformation of their Austenitic structure there are, of course, many procedures being used. Although no standardized procedures have as yet been developed, the following methods are a few of those most commonly practiced today by gage, instrument and machine tool manufacturers. These procedures have proved highly satisfactory and if preceded by the proper heat treating of the steel will provide excellent results in the stabilization of your metal parts.

Procedure No. 1

With this procedure the part is rough ground to within 0.002 inch and is then subjected six times to a temperature of -120 deg. F., allowing it to return to room temperature each time before subjecting it to further cold. It should be held in the cold for a period of time long enough for the cold to penetrate it completely. The final grinding and lapping operations are then performed.

This procedure is used by a well known manufacturer of gage blocks

with a resulting stability within 0.000002 inch. This manufacturer used the United States Bureau of Standards

Test for stability. The test consists of boiling the part in a 1 per cent solution of potassium dichromate and water for 24 hours. If the piece has changed dimensions by more than 2 millionths of an inch, it is not considered stable. This manufacturer reports that he has tested a number of commercial gages and tools by this method, and that only the gage blocks cold treated in chilling units have proved stable.

Procedure No. 2

After rough grinding to within 0.002 inch to 0.004 inch, the part should be subjected to from 2 to 5 cycles of alternate temperatures of -120 deg. F. and 212 deg. F., each time allowing the part to return to room temperature before subjecting it to either the heat or the cold. After this is completed, final grinding and lapping operations are performed.

Stabilization of Cast Iron

The procedure for the stabilization of surface plates and lapping flats used in the manufacture of gage blocks is as follows: They are subjected to temperatures of -120 deg. F. 3 to 5 times, de-



Pick the men who changed to CIMCOOL

It's easy to spot the men who changed to Cimcool[®]—the radically new and different cutting fluid. You'll know them by their broad smiles. Naturally they're happy! For Cimcool covers 85% of all metal cutting operations. And does a *better job!*

This revolutionary cutting fluid—this *chemical emulsion*—replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned cutting fluids. It's longer lasting in machines, too. So Cimcool reduces down-time and cuts labor costs for cleaning and changing.

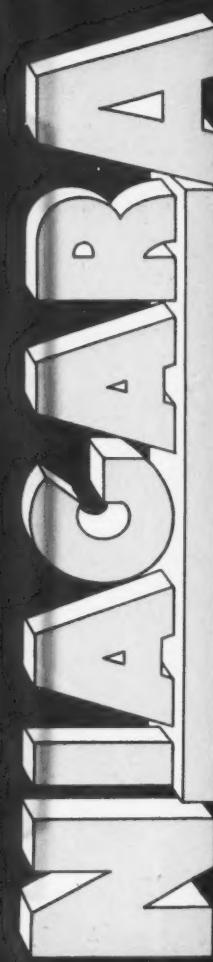
We sincerely believe that one week's run will convince you. And we'll be pleased to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, write for our free booklet "Cimcool Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

[®]Trade Mark Reg. U. S. Pat. Off.

A Production-Proved
Product of
THE CINCINNATI MILLING
MACHINE CO.



for
85%
OF ALL METAL CUTTING JOBS



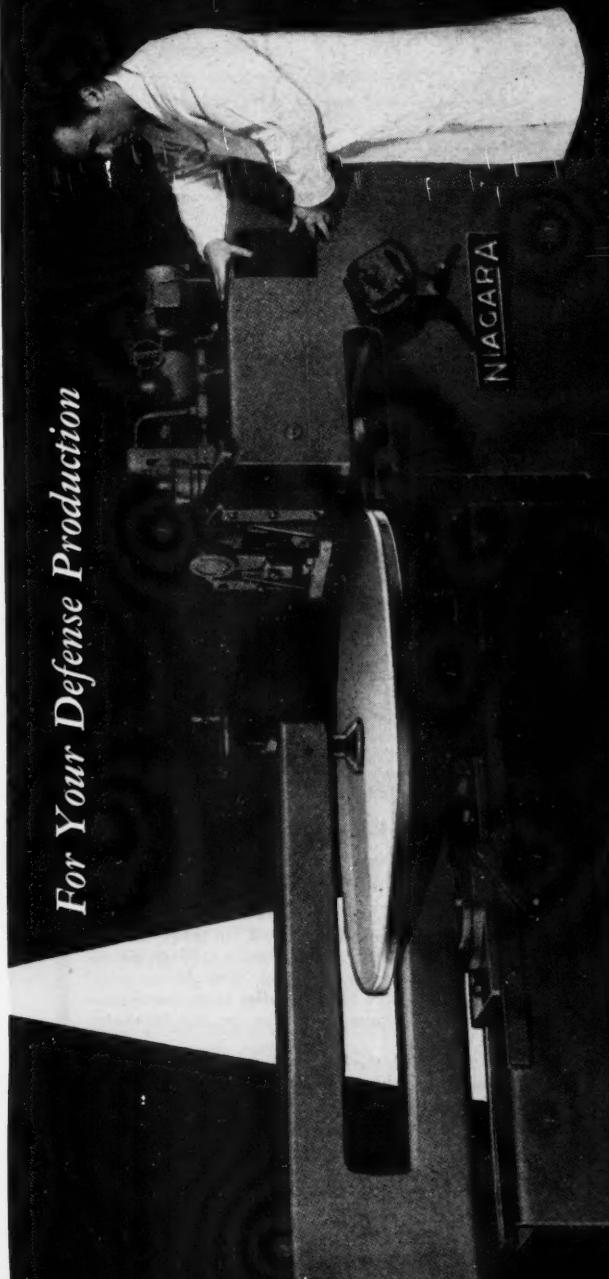
ANNOUNCES A NEW Model 8-8

Hi-Production CIRCLE SHEAR AND FLANGER

- Cuts clean, accurate discs up to 75" dia. in a matter of seconds.
- Turns smooth, high flanges on heads up to 7 $\frac{3}{4}$ " dia. in a matter of seconds.
- Capacity up to 8 ga. mild steel, 12 ga. stainless steel.
- Minimum investment in machine and tools for hi-production of a vast size range of discs and heads.
- Fast set up for either circle shearing or flanging operation.
- Ideally adapted for either high or low and even single quantity production.
- Effortless push button control with new automatic feeding cycle.
- Variable Speed Power Flanging Feed lowers and raises upper flanging roll at optimum speed for ideal flanging. Operator can dial to proper feed rate to suit thickness of material.
- Unbreakable steel construction throughout.

Write for Bulletin 86

V **For Your Defense Production**



NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, NEW YORK

*Manufacturers of America's Most Complete Line of Preven Shears, Machines and Tools
for Plate and Sheet Metal Work*

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

pending upon their size. Between each chilling operation the part should be allowed to return to room temperature before repeating the cold cycle. This treatment will result in a stability within 0.0001 inch. After cold treating, finishing operations to exact size are then performed.

Stabilization of Aluminum

Aluminum forgings and castings can also be stabilized so that after machining there will be no distortion by subjecting the parts to alternate temperatures of -120 deg. F. and 212 deg. F. of heat. Parts must be returned to room temperature before going from one temperature to the other.

Stabilization of Aircraft Parts

It has been found that very close fitting aircraft parts machined in the normal manner will often seize and fail

to operate at high altitudes where extremely low temperatures are experienced. If such parts are frozen to a temperature of between 120 deg. and 150 deg. below zero Fahrenheit and then the final machining, grinding or lapping is performed, these parts will work freely with much closer clearances than otherwise and will work freely after exposure to high altitude and extreme low temperature.

Bearing Steels (S.A.E.-52100)

Because sub-zero treatment has achieved some remarkable results on this particular type of steel, we feel obliged to cite one example of its utility. In this particular case the manufacturer was supplying ball bearings for a purpose, which, due to its military nature, must remain undisclosed. It can be stated, however, that the bearings were subjected to an instantaneous change in

The advertisement features a large black and white photograph of the Fischer No. 1 Oil Groover machine on the left. To the right of the machine, three cylindrical bearing components are shown: two smaller ones standing upright and one larger one lying horizontally. Below the machine, a block of text reads: "Send parts for free grooving and production estimate".

**For Simplicity in
OIL GROOVING!**

The FISCHER No. 1 Oil Groover cuts a wide variety of grooves in bearings up to 8" in length and up to 5" inside diameter. A few simple settings permit you to cut continuous, relieved, straight or spiral grooves at any angle from parallel to perpendicular to the work. Grooves may also be cut in shafts, housings, etc. This machine will slash grooving time and deliver continuous profitable production in your shop. It will pay to find out what it can do on your grooving jobs.

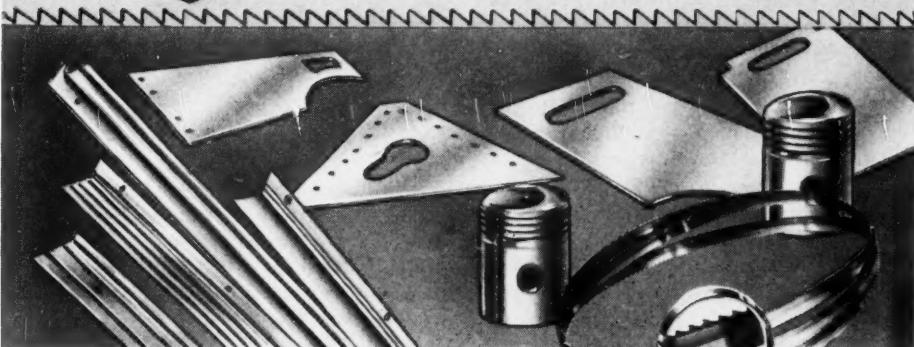
Write for Catalog.

Fischer Machine Co.

Established 1900
316 N. ELEVENTH ST. — PHILADELPHIA 7, PA.



BAND SAW BLADES



THE SHAPE OF THINGS TO CUT



3 FAMOUS BLADES

CONVENTIONAL RAKER AND WAVY SET . . .
for all general purpose cutting, on all contour and cut-off band saw machines.

SKIP TOOTH . . .

Designed for high speed cutting of soft, non-ferrous metals, plastics, wood, rubber, laminated and fibrous materials.

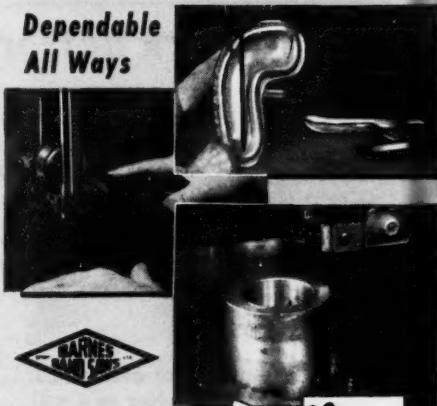
3 PACKAGES

. . . for Your Convenience and Economy

- ① Handy **ARC LINE** package—100 FT. COILS
Coiled loosely to unwind easily Arc Line is compact for storing—convenient for handling.
- ② Economical **LONG LENGTH COILS** over 100 Ft.
You minimize waste using Barnes long, random lengths. Boxed for convenient stripping and safe handling.
- ③ Uniformly tough **WELDED BANDS**—to your specifications. Barnes welds are stronger—properly heat treated for strength, toughness and flexibility—thoroughly tested. They combine safety, economy and convenience.

with BARNES HARD EDGE FLEXIBLE BACK BAND SAW—

Dependable All Ways



There's a Barnes Blade for Every Purpose—all fully described in these two new folders—Ask your Barnes Distributor for literature on Barnes Band Saws and Barnes Hack Saws.



FAMOUS FOR QUALITY



Established 1919

Barnes CO., INC.

1297 TERMINAL AVE. • DETROIT 14, MICH.

inertia from 0 to 18,000 r.p.m. which they could not withstand. The result was that the balls brinelled into the race.

To remedy this deficiency, they were given a sub-zero treatment after the hardening quench, a draw and then allowed to cool to approximately 150 deg. F. before again being subjected to —120 deg. F. after which another draw was made.

This treatment resulted in a Rockwell "C" scale reading of 67½-68 with a grain structure that was very fine and lapped excellently.

The bearings thus treated are not only able to withstand any and all brinelling action caused by the severe impact, but experience no dimensional changes when subjected to varying temperatures.

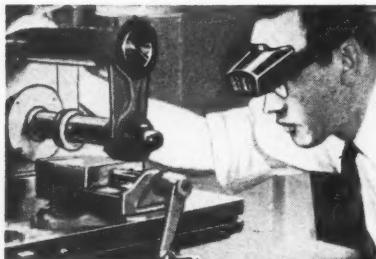
Cold treating has proved equally ef-

fective on other parts made from this particular type of metal.

High-Carbon, High Chrome and Carburized Tungsten Shock Steels

These steels often show a low Rockwell "C" scale reading after heat treatment. If, in addition, they are subjected to a temperature of from —120 deg. F. to —150 deg. F. for a period of from 2 to 4 hours, they will respond with an increase in the Rockwell "C" scale reading of from 4 to 6 points. Care should be taken, however, in making a Rockwell test after the sub-zero treatment because there is a tendency to crack through the Rockwell impression. To remedy this, a slight draw of from 200 deg. F. to 300 deg. F. should follow the material's return from sub-zero to room temperature.

People work better when they SEE BETTER



In Bell Telephone Laboratories:
Precision machinist working on a milling machine finds Magni-Focuser an invaluable seeing aid.

MAGNI-FOCUSER's matched prismatic lenses give needle-sharp magnification. Comfortably light weight. Fits over regular glasses. Leaves both hands free. Normal vision may be resumed by lifting head.

MAGNI-FOCUSER SPEEDS PRODUCTION Leaves both hands free to work

Precision workers do the job faster and more accurately with a Magni-Focuser—the proven binocular magnifier.

Gauge reading, layout work, inspection, tool and die work are just a few of the jobs that need the Magni-Focuser. Speeds precision assemblies, blue print work. Restores the usefulness of the skilled hands of many older workers whose vision needs a seeing aid.

Now aiding thousands of workers, the Magni-Focuser can help your plant produce better. Immediate delivery. 10-day trial without obligation. Return to us if not satisfied. \$10.50.

Send for descriptive folder

EDROY PRODUCTS CO.

480 Lexington Ave.,
Dept. P, New York 17, N. Y.



Enlarged cross section
of the teeth of
a typical Nicholson file.



The right teeth make a big difference

Proper design, even height, uniform sharpness and correct hardening of teeth are tremendously important in lengthening the life and increasing the efficiency of a file. They take on added significance as defense preparedness calls for production speed-ups, steel conservations and maximum tool wear.

Nicholson manufacture has always given uppermost thought to

these vital factors relating to the myriads of tiny "business ends" of one of industry's most indispensable hand tools.

Thus, it can be said that Nicholson and Black Diamond files "speak through their teeth." And what they say is, "*Twelve perfect files in every dozen*—made from top-quality file steel and 87 years' experience." *Sold through industrial distributors.*

HOW TO SELECT, USE AND CARE FOR The right file for the job is interestingly described in words and pictures in Nicholson's famous book, "**FILE PHILOSOPHY.**" FREE. How many copies do you need? Write to—

NICHOLSON
U.S.A.

NICHOLSON FILE CO., 48 Acorn St., Providence 1, R.I.
(In Canada, Port Hope, Ont.)

BLACK DIAMOND
TRADE MARK

NICHOLSON
A FILE FOR EVERY PURPOSE

Buy
KIPP AIR GRINDERS
Because

The RPM's stay up while grinding ... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. The speed of Kipp air grinders drops but slightly when put to work. That means better work — longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
 30,000 R. P. M.

\$42.00

IN U. S. A.



Weight 12 ounces;
 length 6 3/4 inches;
 chuck size 1/8 inch.
 Wheel guard re-
 moved for better
 illustration.

MADISON-KIPP CORP.
 208 Waubesa St., Madison, Wis., U.S.A.

• Skilled in DIE CASTING Mechanics
 • Experienced in LUBRICATION Engineering
 • Originators of Really
 High Speed AIR TOOLS

It should be noted that these steels will respond to sub-zero temperatures even after being at room temperature for quite some time.

Nickel Carburizing Steels

Nickel carburizing steels such as S.A.E. 2315, 2512, 3312 and any of the other nickel combinations respond unusually well to sub-zero transformation.

Oftentimes during the quenching from the carburizing heat, it will be found that the core hardness of these steels will be as desired, but the Rockwell "C" hardness of the case may be below specifications. To increase the case hardness, there is a natural tendency to reduce the hardening temperature to a point where the retained Austenite condition will disappear. This practice is not satisfactory as it results in a decrease in the core hardness.

Through cold treatment it is possible to accomplish both purposes. By subjecting the part to temperatures of -120 deg. F. to -150 deg. F. from 2 to 3 hours after the core hardness has been obtained, the case will increase in hardness of from 6 to 15 points Rockwell "C" scale. The core will not be affected because it contains only a small amount of carbon and consequently there will be little retained Austenite to consider.

High-Carbon Steel

The amount of Austenite retained in straight carbon steel, after it is returned to room temperature following the quench, is usually not in sufficient quantities to be detrimental. Only in those cases where the part is to be put to extremely hard use is it necessary to complete the transformation with sub-zero temperatures. An example of this

MORE HOLES PER HOUR — PER DOLLAR

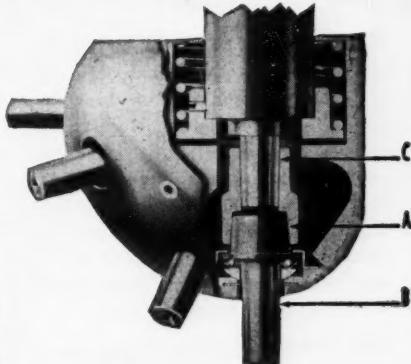
Increase production of any standard drilling machine by adding a Lign-o-matic, the *only* drill turret with the patented, self-centering principle that guarantees sustained accuracy equal to the drilling machine itself.

FOR ALL CONSECUTIVE DRILL PRESS OPERATIONS

PROVED PRODUCTION INCREASE

— Turret indexes faster than tools can be changed or work moved to another spindle. A single Lign-o-matic will release 5 drilling machines for other work and still show increased production and reduced costs on original job.

VERSATILITY—Fits any standard drilling machine without altering the machine. Handles operations such as drilling, reaming, counterboring, and tapping (on reversible spindle machines), up to $\frac{1}{2}$ " diameter in any material.

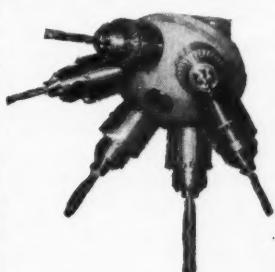


PRECISION — Patented, self-centering tapered drive (A) automatically locks turret spindle (B) into exact alignment with drilling machine spindle (C) for sustained accuracy.

GUARANTEE — May be returned in 10 days for any reason for full refund of purchase price. Two-year guarantee against defective parts.

PRICE — Model D, 6 spindles with No. 2 Jacobs male taper \$235.00
Chucks extra at established prices.

DELIVERY — Currently, 2 weeks.

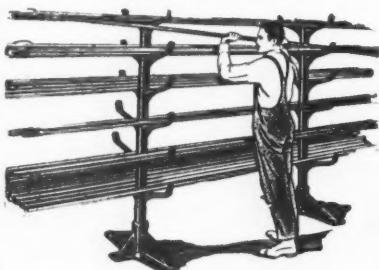


- Please rush Lign-o-matic turrets for
(drill press make)..... (size).....
(quill dia.)..... (spindle taper).....
My name.....
Title.....
 Please send literature on Lign-o-matic turret.
(Attach coupon to company letterhead)

HOWE & FANT, INC.
527 FLAXHILL RD., SO. NORWALK, CONN.

SPEEDS UP STOCK-ROOM SERVICE

The BROWN SECTIONAL RACK saves the time previously lost in end-hauling each bar of stock its entire length from the old-style, closed-side Rack, the Brown Rack requiring but a few inches of side movement. Each length, width and thickness of stock is displayed in gold-fish visibility for instant selection. Workmen waiting for stock are served without waste of time.



Any time you require additional storage space, all you need do is add more units. If you want to relocate it at any time, you can do so quickly for it is unattached to the building.

It is a simple, durable article made of metal in five styles. It can't burn, warp, sag or twist; depreciation is practically nil. SEND FOR BULLETIN No. 26-B DESCRIBING

BROWN'S **QUICK-SERVE RACKS**

BROWN ENGINEERING CO.

120 N. THIRD ST. READING, PA.
RACKS • VISES • CLUTCHES • COUPLINGS

is the cupping punch used in the first operation of drawing steel cartridges. Before cold treating the punch, it failed after drawing 3,000 shells. After being subjected to the chilling treatment, 30,000 shells per punch was the standard production.

Another example of the utility of cold treating high carbon steels is that of 1.10 carbon step cut reamers. By subjecting these to a temperature of -120 deg. F. for a period of from 2 to 4 hours, tool life has been increased from 100 to 400 holes, and instead of the flute ends becoming tapered as before, they now wear evenly.

Magnet Steel

A well-known speedometer manufacturer reports that satisfactory magnetic properties for his magnets could not be obtained until they were given a sub-zero treatment and then magnetized. After freezing them for a period of 4 hours at -120 deg. F., followed with a draw of 300 deg. F. for one hour, and then magnetizing, the parts exhibited improved properties.

Another interesting test showing the effects of cold treating on the magnetic properties of steel was reported by a large steel products manufacturer.

Data and Part Information Requirements

Season gages to prevent change in finished size. Solution with sub-zero chilling.

Thread gage treated as follows: 2 hours sub-zero chilling—2 hours boiling water—2 hours sub-zero chilling.

Other gages treated according to gage and steel. Some are heat treated one or more times or normalized between machining operations. Size determines number of chilling applica-

Who's Training Your New Employees . . .

Don't put your new employee
in this position . . . Help
him off to a good start with
the proper training aids . . .



Now available . . . CARBIDE CUTTING TOOLS, the first authoritative text book on carbides, designed to inform the student, the designer and the man at the machine.

"KNOW HOW"—the best productive use of manpower, machines and materials is essential in our present emergency. It is with this in mind that V-R is making this book available

CONTENTS: Machine Tools and the Carbides. Converting to Carbides. Tool Angles. Machinability. Tipping a Carbide Tool. Grinding Single-Point Tools. Cutting Power, Speeds, Feeds. Carbide Tool Design. Coolants and Carbide Tools. Carbide Forming Tools. Carbide Milling Cutters. Sharpening Milling Cutters. Multiple-Edge Carbide Tools. Cutting Speeds, Feeds, Forces. Multiple-Edge Tool Design. Selection of a Carbide. Tool Materials, Assembly. Grinding and Use of Tools. Index.

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tions—larger gages chilled more than once.

Sequence of Operations on Thread Gage:

1. Machined, heat treated and rough ground.
2. Chilled and heat treated.
3. Finished by lapping.

Results

Gages hold size in transit to customer's plant—no rejects.

Savings

All time previously lost in correcting or replacing gages whose size was distorted due to temperature changes and jarring.

Dimensions on Gages and Precision Parts

Quick-aging of steel prevents expansion and growth of gages.

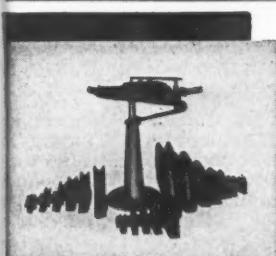
Another valuable use of sub-zero

chilling finding wide-spread application today is its use by tool and gage manufacturers for seasoning, setting, and counter-annealing gages, arbors, mandrels, and so forth.

This prominent manufacturer of gages experienced difficulty in preventing growth or change in size of gages during shipment to customers, and during later use in customers' plants. Jarring and temperature changes in transit affected finished gage size and hours of careful work were wasted. When gages were not distorted in transit, future metal growth and warp resulted in spoiled work in the customers' plants.

Alternate Cold And Heat Treating Assures Correct, PERMANENT Size

With the installation of sub-zero industrial chilling equipment, together



Hand-Powered
"American" A-30



Motor-Powered
"American" 2PB

bend pipe by hand or power with

"American"

cold pipe, conduit and heavy wall tube

BENDING MACHINES

Fast... Simple... Dependable...

RADIANT HEAT BENDS in Standard Pipe

Fast . . . Accurate . . . Average bend takes only 10 seconds! Up to 180° bends . . . all sizes from $\frac{1}{2}$ " to 2". Usual radiant heat bends for 1 $\frac{1}{4}$ " at 6" and 9" radii can be supplied. Only 7 parts. Occupies 18" x 18" floor space.

Capacity $\frac{1}{2}$ " to 2" standard pipe . . . Minimum radius 5 times pipe diameter up to 180° . . . Maximum radius 13". Complete with rolls for each size pipe. Standard motor equipment 2 h.p.

Special radii supplied
on request.

"American"
PIPE BENDING MACHINE
Company INC.
Factory and Main Offices:
14 Furnace St., Poultney, Vt.

CARD Machine Screw TAPS



*Double-Checked
to give you
Double protection at ordinary cost*

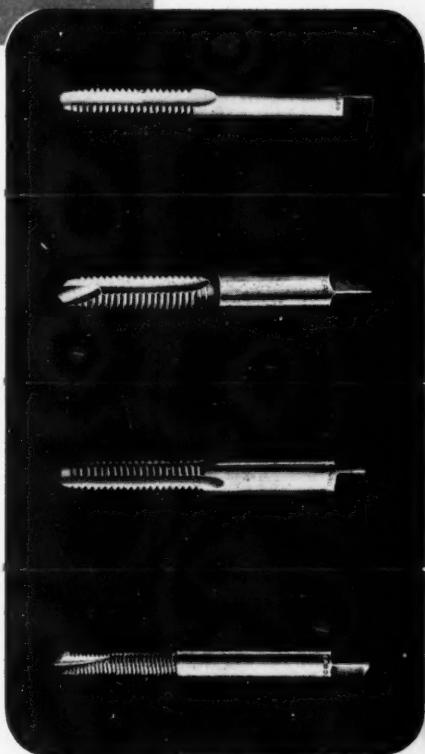
If anyone asked you where taps get their final inspection, you'd probably answer: "At the factory where they're made." In the case of ordinary taps you'd be right. But you'd be dead wrong about Card Taps. Because at times and places unknown to us, the Pittsburgh Testing Laboratory buys Card Taps on the open market, tests them thoroughly and certifies the results.

That means double the protection you get with run-of-the-mill taps — yet *Card Certified* Taps are right at ordinary price levels!*

You can always count on prompt, helpful service from your nearby Card Distributor. Contact him for Card Machine Screw Taps and other Card Taps and Cutting Tools.



Card Machine Screw Taps are available in carbon steel cut thread and high speed steel cut thread or ground thread.



S.W. CARD
MANUFACTURING CO.
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL COMPANY

UNIVERSAL
DRILL BUSHINGS

Universal Drill Bushings with super-honed bores have been the first choice of industry since the founder of Universal Engineering Co. originated standard drill bushings nearly 30 years ago. Available in standard and special sizes to speed and simplify your jig drilling at greatly reduced tool breakage costs. Complete stock of standard bushings available for immediate shipment. Write today for complete information.

**UNIVERSAL ENGINEERING CO.
FRANKENMUTH 9, MICHIGAN**

with usual heat treating, the gages are now properly treated to hold finished size under all normal temperature changes and handling.

Gages are treated 2 hours in the Sub-Zero unit, then in boiling water, oil, or salt bath, depending upon steel used, and then back to Sub-Zero treatment for 2 additional hours.

Shrinkage Table

The approximate shrinkage of rings or cylinders 2 inches in diameter, chilled from 70 deg. F. to -120 deg. F., varies with the metal as shown below:

Tool Steel	0.0022 inch
Phos. Bronze	0.0032 inch
Alum. Bronze	0.0032 inch
Brass	0.0036 inch
Aluminum	0.0043 inch
Magnesium	0.0045 inch

Other diameters shrink proportionately

For quick and conservative calculation it is generally the rule that tool steel will shrink approximately 0.001 inch in the -120 deg. F. chilling machine for each inch of diameter. With bronze or brass you may expect 50 per cent more shrinkage, or 0.0015 inch shrinkage per inch of diameter. With aluminum and magnesium 100 per cent more, or approximately 0.002 inch shrinkage, can be obtained per inch of diameter. These same dimension changes can be accomplished by 200 deg. F. rise in temperature.

It is not recommended that cold alone be used for shrinking diameter much below 2 inches. In such cases the female part should be warmed by electro magnetic inductive heating, hot water, hot oil or hot blast.

Production Pointers

from

GISHOLT

TIME
SAVING
IDEAS



Why Gisholt's Recommendations Are Unbiased—In helping you solve your turning problems, Gisholt engineers have no reason to favor one type of machine over another except on the basis of its ability to best serve your needs. For Gisholt manufactures both manually operated turret lathes and automatic lathes.

FASTERMATIC KEEPS 8 CUTTING TOOLS BUSY TO TURN OUT FORGED PARTS IN A HURRY

Job Requires Rough, Finish Machining on All Surfaces

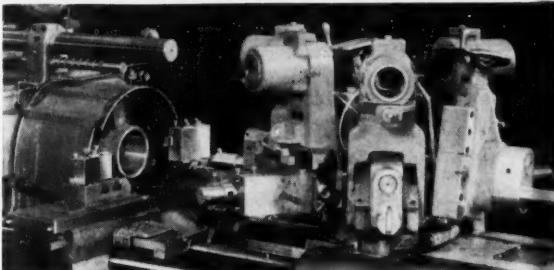
The trick here was to turn these steel forgings into top slips for oil well equipment in the fastest, lowest cost way. The nature of the cuts—both straight and taper bores . . . facing . . . inside deep grooving . . . and two chamfers—indicated that the 2F Fastermatic Automatic Turret Lathe was a "natural" for the job.

All this work, both rough and finish machining, calls for all six hexagon turret faces, and the individual front and rear cross slides . . . 8 tool approaches to the work.

The operation starts with rough boring of the ID from first turret station. At the same time, the front cross slide rough faces. Next, the rest of the ID is rough tapered by a slide tool mounted on the second turret station and which is guided by a cam on the rear cross slide.

Maximum Use of Tools

Indexing to the third turret station, the straight bore is finished, while finish facing is handled by the rear cross slide. Rough grooving in the straight bore follows. A standard grooving tool on turret station four reaches in for this deep operation. This tool is actuated by a stop on the headstock which causes it to feed to depth while the turret feeds forward.



Tooled up to turn out 5" top slips, this Fastermatic keeps 8 tool stations working at top efficiency.



At right the rough forging. Center view shows taper end after machining. At left is the same part reversed.

At station five, tools finish the taper bore and chamfer the inner edge. Ending the job, a grooving tool at station six finish grooves and makes a small bevel in the inner groove. Time? Only 5.5 minutes, floor-to-floor—with the machine's automatic cycle allowing the operator to handle other work on a second Fastermatic. It's another example of how the

flexible standard tooling and automatic speed and feed changes make the Fastermatic ideal for high efficiency output where a variety of diameters and straight and angular surfaces are machined.

With all tool stations working, the Fastermatic performs all rough and finish facing, straight and angular boring, and grooving operations on these parts in a single chucking.

FOR MORE PRODUCTION FROM

A CLEAR-CUT CASE FOR RUGGED DESIGN

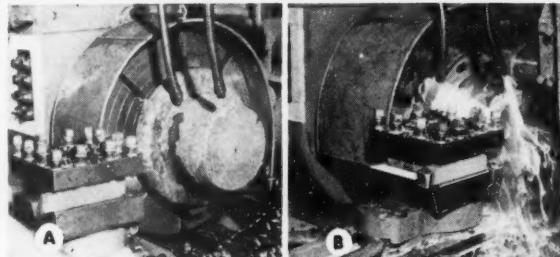
New Saddle Type Turret Lathe Cuts Time $\frac{2}{3}$

If you want convincing evidence of what rigidity and pulling power can do to costs, this is it.

This manufacturer formerly machined these 12½" mild steel forged companion flanges on an older type machine. Production was one part per hour; only one cut at a time could be taken. Now, with the job on a Gisholt 3L Saddle Type Turret Lathe, 3 parts are finished in the same time. The big difference lies in sheer power and rigidity.

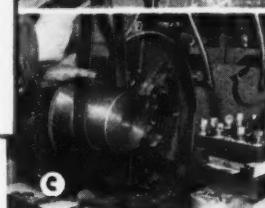
The part is chucked on the large OD. Tools in a multiple turning head simultaneously rough the OD and ID of the body. Finishing is handled in the same manner from the second turret station. Tools on the quick indexing square turret do the facing, chamfering and radius while the hexagon turret is working.

* On the turning cut a 1¼"



Simple as A B C, hiking production $\frac{2}{3}$ by use of the right lathe. "A" photo shows forged part chucked. "B" photo, simultaneous machining by hexagon turret and square turret. "C", the completed part—20 minutes later.

carbide tool bit removes up to 1⅛" on the side with a .019" feed. That's a sizable hunk of metal, removed without chatter. This overhanging tool provides physical proof of machine's ability to take all the tools can stand.



Simply by putting this job on a rigid, powerful Saddle Type Turret Lathe with multiple tooling, output was increased two-thirds.

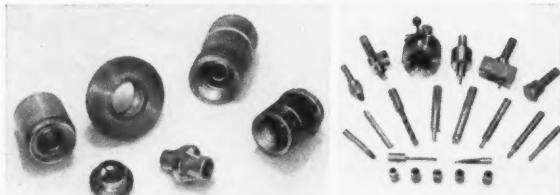
THIS KIND OF PLANNING PAYS OFF

With Proper Tooling Ram Type Lathe Handles 6 Different Parts for One Assembly

Careful planning pays off on any job, of course. But here's an outstanding example of it—for machining six different parts of the same assembly—where precision is required but quantity doesn't warrant a high production setup.

Tooling is smartly planned for the Gisholt No. 4 Ram Type Turret Lathe so there is fast changeover for handling all the pieces. The air chuck with special fixtures is quickly adapted for both internal and external holding.

External work and facing are done by tools on the quick indexing square turret on the cross slide carriage. These handle precision machining

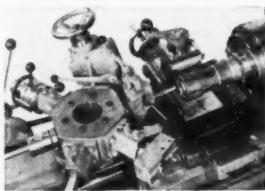


The internal machining of these six different parts for one assembly is all handled by this one group of tools (right) on the hexagon turret.

on all six of the parts.

Yes, well planned tooling can solve production problems. Good reason why you should check with Gisholt for the tools that can help cut your machining time and costs. Ask about them.

The machining of six different parts is planned around one set of tools. This user is time and money ahead.



One of the parts set up in the No. 4 Ram Type Turret Lathe.



MAN-HOURS AND MACHINES

TIME
SAVING
IDEAS

PARTS GET QUICK TRIMMING (36 LBS. OF METAL) BY NO. 12 HYDRAULIC



4 Tools Team Up to Make Deep Cut on Same Surface

Here's a way to hog off metal with real finesse—the way this No. 12 Hydraulic Automatic Lathe brings parts down 36 lbs. to size. There is too much depth of stock on these 7½" N.E. 8640 cylinders for one tool to remove in a single pass, so the job is divided among four tools.

Tools are mounted in individual cam controlled sliding tool blocks on the longitudinally feeding front carriage. As each tool reaches the position shown by the first tool (see drawing), it is cammed inward to follow the required contour. Since the tools are successive, they follow the depth lines shown in the drawing. The fifth tool finishes the large OD at the right end, and the single tool on the rear carriage forms the right radius.

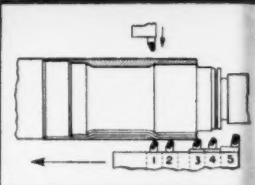
Floor-to-floor time is 8 minutes. Because tool load is



Close-up of the No. 12 Hydraulic job, showing the four tools on the front carriage which remove 36 lbs. of metal.

moderate by successive cutting, tool life is excellent. Also, operator handles another No. 12 Hydraulic which does other end of cylinders. Get new No. 12 Hydraulic Booklet.

In four successive contour cuts, with cam-controlled slides, this No. 12 Hydraulic brings cylinders down to size in one automatic operation.



The shaded area at top shows total metal removed by successive cuts from tools 1, 2, 3, 4 at bottom. Fifth tool finishes large OD at right of cylinder.

FRONT, BACK AND INSIDE OF HEAVY PIPE FLANGES MACHINED AT SAME TIME

Entire Job Done in Single Chucking

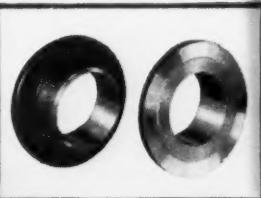
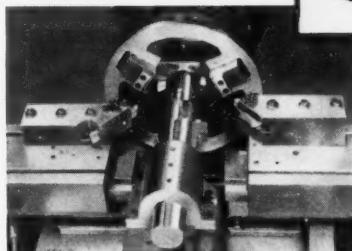
Note this efficient setup for machining heavy duty steel pipe flanges on a Simplimatic Automatic Lathe. See how it's planned for simultaneous machining of all surfaces—front, back and inside?

The part is held on the hub with a special fixture. Piloted tools on the center slide rough and finish bore and chamfer. The two back tools, which are operated through the spindle, face and chamfer the neck. Tools on the front and rear slides rough and finish the two flange steps.

All cuts are simultaneous—with the 8" pipe flanges being finished in one operation at a

rate of one part every 3.7 minutes, floor-to-floor.

This manufacturer profits from the adaptability of the Simplimatic by rough and finish machining all surfaces of these pipe flanges in one quick operation.



Finished 8" pipe flange

This tool planning you see here enables this manufacturer to machine both ends and inside of flanges at same time.





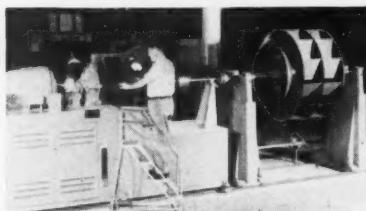
TIME
SAVING
IDEAS

Unbalance
Located and
Measured;
Correction
and Re-check Made
on Balancer

There's mighty slim chance for noise, vibration and excessive bearing wear in the large blowers which The Trane Company, La Crosse, Wisconsin, fabricates for its air-conditioning systems. Precision balancing on Gisholt Balancing Machines does away with these hazards.

The large blowers, in sizes up to 60" and weighing up to 3 tons, are balanced on the Type 6UH machine shown here. Balancing is done right on their installation shafts—with the work supports quickly adjustable to each shaft length by movement along

LARGE BLOWERS STAY QUIET, LAST LONGER THROUGH PRECISION BALANCING



This Gisholt Type 6UH Balancer locates and measures unbalance in various size blowers

the track set in the floor.

In operation, each unit of unbalance shown on the amount meter equals 0.1 oz. of correction weight. There's no computing necessary on the part of the operator . . . he merely reads the amount of required correction. When the amount and location of unbalance are determined, steel correction washers are welded at the indicated points

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Covered in Gisholt
Balancing School

How to design rotating parts for fast, economical balancing is just one of the broad range of subjects covered fully in the Gisholt Balancing School. New classes start Nov. 5th and Dec. 3rd. Write for information.

and the part is checked for accuracy of balance.

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Two Superfinishers Quickly Handle All Bearing Surfaces

Because these outboard motor crankshafts seem peanut size compared to the others you know, you may think Superfinish is unnecessary. But, this manufacturer knows it's just as vital for better performance and long-

er life as for big-brother crankshafts in automotive and locomotive engines.

The r.p.m.'s of these little two-throw crankshafts are very high, and the bearing loads are severe. To Superfinish both the crankpin bearings and main bearings, two Superfinishers are used. The benefits are many—removal

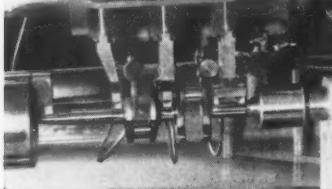
of grinding chatter marks . . . simplified grinding and lower grinding wheel costs . . . improved geometry . . . and simplified assembly because the resultant "base metal" needs no break-in tolerance.

Does Superfinishing add to production time and costs? Not a penny . . . there are 25 hours per thousand crankshafts for grinding time and the same for Superfinishing. That's actually a 35% improvement over the former rough and finish grinding time. And the job is far better.

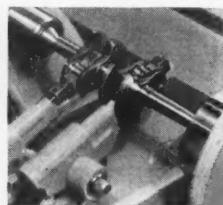
Write for booklet, *Wear and Surface Finish*.

Superfinish pays big dividends on these little crankshafts by actually cutting grinding time as well as insuring better fits, longer life.

Machine with 3 Superfinishing stones for handling crankshaft bearing surfaces.



This second Superfinisher does the crankpin bearings.



No. 1051
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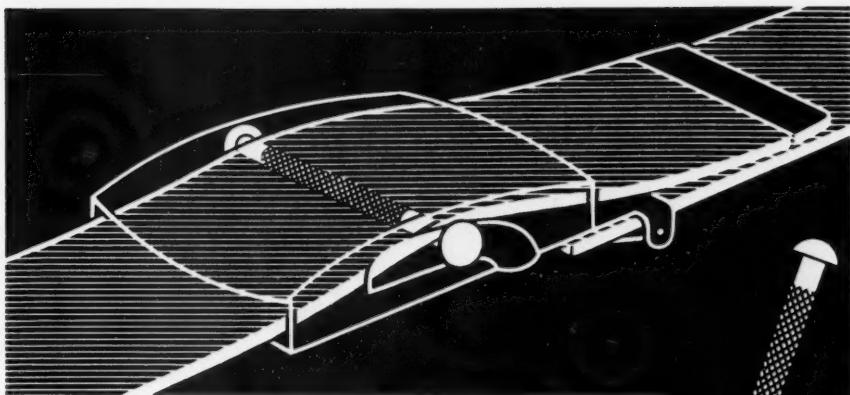


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Thermal Distortion, Deflection And Vibration In Machine Tools, Part I

From a paper delivered by the author before the Rockford Chapter
of the American Society of Tool Engineers.

By DR. MAX KRONENBERG

HERMAL distortion, deflection, chatter and vibration in machine tools have a marked effect on tool life, surface finish, working accuracy and maintenance of the machines, but relatively little was known about the underlying principles until a few years ago. It is not necessarily the heavy chatter that causes destruction, but often light vibration in a machining operation, which can neither be seen nor heard.

Likewise, dimensional inaccuracy is often due to thermal distortion and to mechanical deflection. Although these three factors—thermal distortion, deflection and vibration—are interdependent to some extent, it is more convenient to discuss them separately.

Thermal Distortion

Every skilled machine operator is well aware of the fact that his machine performs differently in the morning than in the afternoon, rendering it necessary for him to reset tools, adjust

gibs, and to watch the dimensions of his workpieces carefully in order to avoid scrap. These conditions usually occur on turret lathe jobs, boring operations on lathes, drilling operations, reaming, milling and grinding.

Unskilled labor is often not familiar with these facts and, with increasing employment of unskilled help in the near future, it may well be worthwhile to take thermal expansion into consideration. Such consideration will save downtime and increase production.

Thermal expansion has become more important in recent years because of the increase in spindle speeds which began with the advent of carbide tools. The heat which is generated in many machines causes inaccuracies which cannot be tolerated in many cases.

Thermal Expansion Tests

A few examples taken from many tests which have been made should be sufficient to illustrate these conditions. The examples cover milling machines,

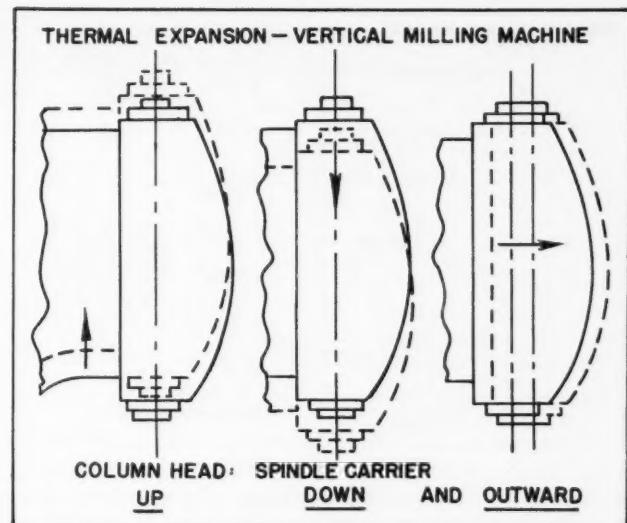
Fig. 1 — The thermal expansion between spindle and table of a vertical milling machine takes place in three major directions, as shown in these sketches.

broaching machines, turret lathes and horizontal boring mills. In all cases temperature rise and thermal distortion were measured, permitting a comparison of the relationship between heat and expansion in machine tools. The tests were mostly carried out on idle running machines, but in some cases loads were applied, simulating those occurring in machining operations.

Vertical Milling Machine

The thermal expansion between spindle and table of a vertical milling machine takes place in three major directions as shown in Fig. 1.

The heat developed in the column of the machine causes an upward movement of the head and of the spindle carrier. The heat generated in the spindle carrier is the cause for a downward movement of the spindle. These two effects balance to a certain extent but do not necessarily occur at the same time. The spindle may therefore slowly rise and then drop again until a condition is reached where the spindle only rises. This irregular rise can usually be observed during the first two hours of operation of a vertical milling machine.



In the case of a horizontal milling machine the spindle-rise is more uniform.

In addition to these two movements, the spindle moves consistently toward the operator of the machine, away from the column face.

In the upper portion of Fig. 2, the temperature rise is shown, while in the lower portion the expansion is plotted that took place between the table and the spindle. The indicated temperature was measured at the lower spindle bearing, but other temperature measurements were also taken. It will be seen from the top curve marked "before," that the temperature increased 15 deg. during the first hour and another 15 deg. during the next six hours, which is a total of 30 deg. temperature increase within 7 hours.

During the first hour, the spindle-table distance increased .0008 in. and another .032 in. during the next six hours, which is a total of .004 in. within seven hours and naturally too large an increase to permit accurate work.

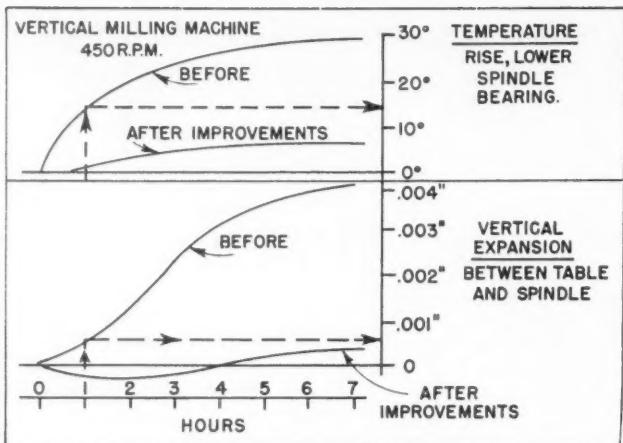


Fig. 2—(Above) The temperature rise in the lower spindle bearing of a vertical milling machine is plotted against time. (Below) Graph showing vertical expansion between table and spindle.

value, it was found desirable to make a detailed investigation.

Horizontal Boring Mill

The improvements made to reduce temperature and expansion included: changing the type of bearings, readjusting them, replacing oil for grease lubrication, selecting a different grade of oil, reducing the amount of oil supply and similar factors. The results obtained in this way are indicated by the curves marked "after improvements." They were very satisfactory as can be seen from the illustration. The temperature rise was only 6 deg. during seven hours and the expansion was reduced to .0006 in. for the entire time of seven hours. These reductions amount to about 75 to 85 per cent.

As a rule of thumb, the temperature increase in a machine tool should not exceed $1/100$ deg. per r.p.m. within the first hour of operation. If this limit is exceeded, a more thorough investigation of the causes is indicated. If the one hour short-cut test shows less rise, the distortion will generally not be serious and may be disregarded. In the test from which the data shown in Fig. 2 was obtained, a temperature rise of $3.3/100$ deg. was encountered. Since this amount was three times the admissible

In the case of horizontal boring mills (and also on lathes and horizontal milling machines) it will generally be found that the spindle moves consistently upward with increasing temperature, as shown in Fig. 3. Here, the temperature rise is plotted against time and the thermal expansion against temperature rise, for a horizontal boring mill.

With a temperature increase of 20 deg. for the first hour indicated with the boring mill operating at 175 r.p.m., an increase of about .120 deg. per r.p.m. was noted, which is twelve times the admissible value. The spindle moved up .0026 in. during the first hour.

All data are given in temperature rise rather than in temperature, because it is easier in this way to compare tests taken at different temperatures. Usually the temperature rise of the room is deducted from the temperature rise of the machine.

In the case of this boring mill trouble was experienced when trying to reduce thermal expansion. When the machine was cold, the accuracy of the holes, bored on the machine was better than

Fig. 3—Graph showing method of plotting temperature rise against time and the thermal expansion against temperature rise, for a horizontal boring mill.

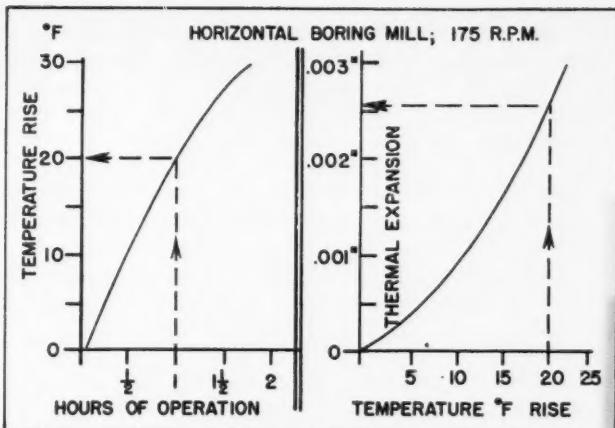
when the machine was warm. On the other hand, however, with the cold machine more trouble was experienced with vibration which would subside

when the machine got warm. The main reason for this performance was traced to the front bearing in the spindle carrier.

The left hand sketch in Fig. 4 shows the number of rollers that were lubricated when the machine was cold. The oil was picked up at the oil pocket and was ejected by the rollers after a travel of only 45 deg. of one turn of the spindle. Such lubrication is, of course, insufficient and metal to metal contact is established between rollers and races, causing self excited vibration.

The right hand sketch shows the condition when the machine was warm. The oil was ejected by the rollers after completion of almost a full turn of the spindle. Hence, no substantial metal to metal contact existed and no vibration was noticed. The spindle, however, had risen and the accuracy of the holes was now poor.

Here we have a case where the desirable effect of warming up of the machine, namely chatter reduction, was combined with an undesirable effect, namely upward movement of the spindle. In order to remedy this situa-



tion it was necessary to provide another oil pocket on top of the bearing for lubricating the rollers when the machine was cold. In addition, the oil supply was reduced and the spindle bearings were adjusted to reduce thermal expansion.

Adjustment of Bearings

Measuring the adjustment of the spindle bearings should be made while the machine is rotating, an operation which requires the use of specially designed equipment. Such equipment can also be combined with a device for superfinishing the bearings underload.

Turret Lathe

In the case of checking a turret lathe, the temperature rise was 3/100 deg. per r.p.m. for the first hour which is about 200 per cent above the accepted maximum. The total temperature rise of this machine running at about 1000 r.p.m. was as much as 30 deg. for the first hour. During this time the spindle moved .002 in. upward, while the horizontal movement was only .0007 in. During the second hour the rise was

considerably less, namely only .0004 in. vertically and .0001 in. horizontally.

With these large vertical movements during the first hour of operation, drilling, reaming and similar operations are adversely affected, because the holes would be out of round by twice the amount of spindle rise. Scrap is unavoidable and time is lost for resetting the tools, when the temperature rise is overlooked.

Engine Lathe

When turning an O.D. on an engine lathe, a horizontal movement of the spindle relative to the tool is mostly not critical because the operator can easily move the top slide back to compensate for thermal distortion. Vertical spindle movement, however, will produce workpieces that are out of round, particularly when the diameter is small.

From the standpoint of the produc-

tion planner it is therefore often advisable to have all O.D.'s turned first and all inside work performed later when the machine is warm. Such planning will, of course, not always be possible and it is therefore useful to investigate a machine part for thermal expansion so that improvements can be made to keep thermal distortion to a negligible minimum.

Broaching Machine

Another example may be quoted which shows the effect of load on temperature rise in a hydraulically driven broaching machine. The oil temperature in the cylinder increased only 18 deg. within 7 hours, and 27 deg. when a load of 300 lb. was applied. Although this is an increase by 50 per cent in temperature rise due to the load, the rise was less than in some mechanically driven machines.

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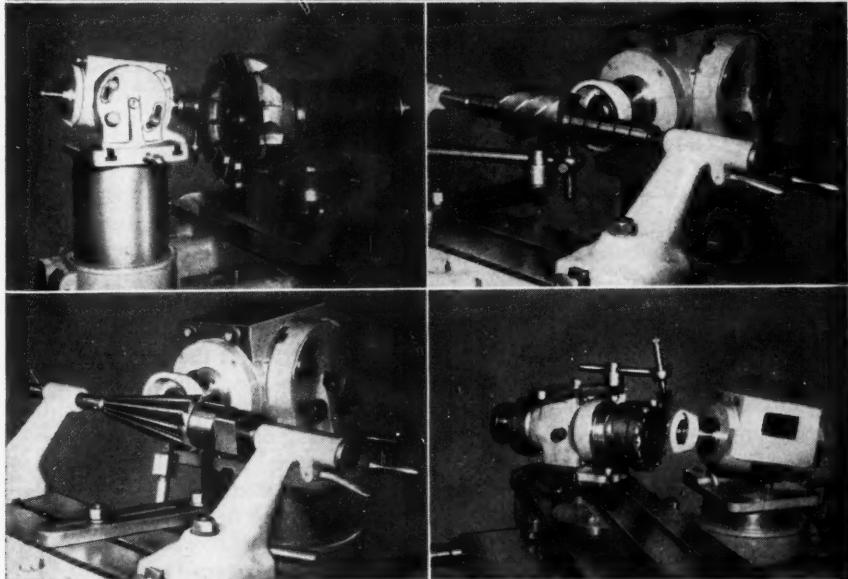
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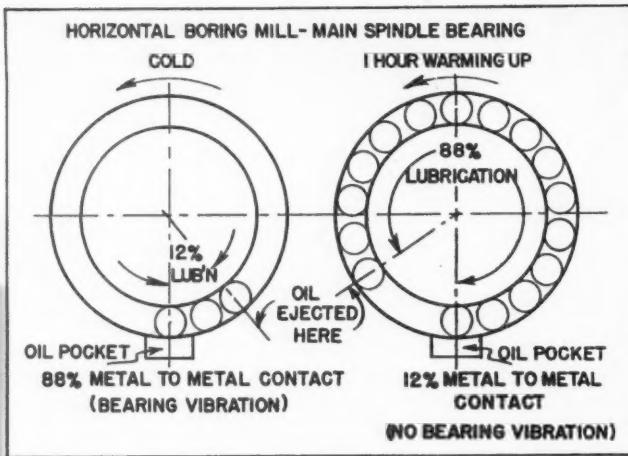


Fig. 4—Sketch at left shows number of rollers that were lubricated when machine was cold. Sketch at right shows condition after 1 hour warming up period.

The temperature rise causes usually a buckling of the column, which bends backward, away from the stand of the operator.

Deflections Under Load

Deflections of machine tools under load are a measure of the rigidity of the machines, but of a more complex nature than the deflection of a bar on a test stand. The complexities are due to the fact that an assembled machine is composed of many parts with different fits, while a test bar is just a single piece of material. The undesirable deflection occurring between tool and workpiece should be of major interest

to every operator of a machine tool. On a lathe, this deflection corresponds to the distance which the tool recedes from the work due to deflection of bed, headstock, carriage, and so on. On a horizontal milling machine the most important deflections occur between arbor and table. On a radial drill, the lifting of the arm due to the cutting force is of major significance for drilling accuracy and preventing the breaking of the drills.

Many tests have been conducted which prove that the relationship between load and deflection may be represented by a curve, as shown in Fig. 5, which is a hysteresis curve.

The dotted line from the center to point "A" is obtained when applying a load and gradually pushing tool and

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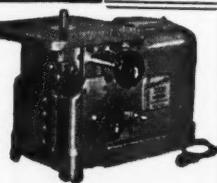
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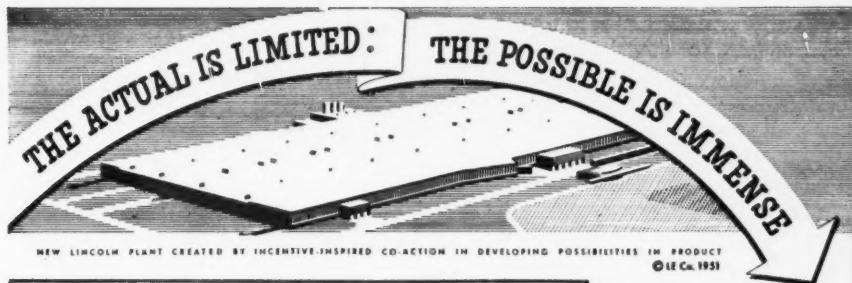
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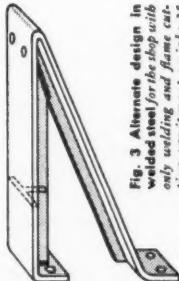


Fig. 3 Alternate design in welded steel for the shop cutting equipment weighs 35 pounds... costs only \$64.70... a saving of 46% over Figure 1.

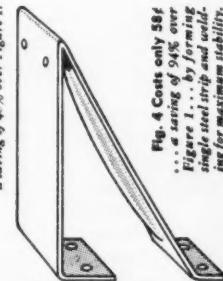


Fig. 4 Costs only 58¢... a saving of 94% over Figure 1... by forming single steel strip and welding for maximum stability. Weighs only 9 pounds.

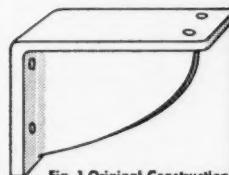


Fig. 1 Original Construction. Machinery bracket weighs 39 pounds. Has $\frac{3}{4}$ " and $\frac{5}{8}$ " sections. Requires milling and drilling. Costs \$9.10.

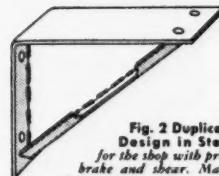


Fig. 2 Duplicate Design in Steel for the shop with press brake and shears. Made from 8 gauge (approximately $\frac{1}{8}$ ") sheet... saves 27 pounds of metal. Costs \$5.13 less than original construction.

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work apart. At the end of the load application—at say 1500 lb.—the deflection is indicated by point "A". Upon release of the load, the indicator hand does not return to zero deflection, even when the entire load has been removed. The indicator stops at point "B".

Reversing the direction of the load by pulling tool and work together, a motion of the indicator occurs until point "C" is reached at 1500 lb. Releasing the

load again, the same observation will be made as before, namely that the indicator does not return to zero, even when the load is zero. It stops at point "D". Applying again a push load, the deflection reaches point "A" again, but at a different rate as indicated by the branch DA of the curve. This cycle can be repeated several times.

The straight portions B - B' and C - C' are of particular interest. They do not indicate distortion, but rather motion of assembled parts. A light load of a few pounds is sufficient to produce a large motion of the indicator hand. The load must only be large enough to overcome the friction between such parts. The friction prevents motion and a load in the opposite direction is required to bring the hand back to zero.

In the case of deflection, it is the energy stored in the deflected part which brings the member back to its original shape, that is to zero deflection upon release of the load. Since this is not the case along B - B' and C - C' we

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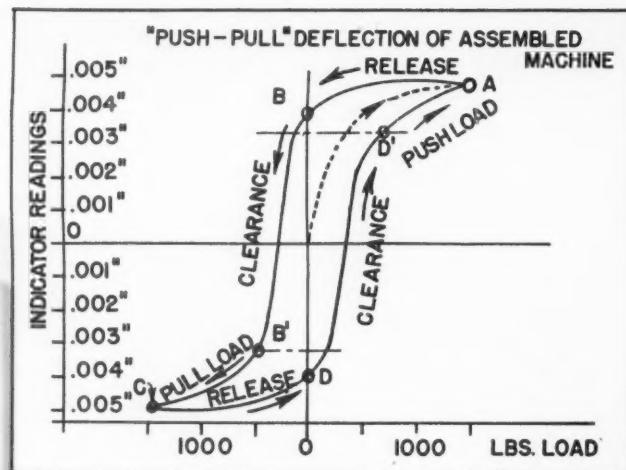


Fig. 5 — Graphic presentation showing relationship between load and deflection.

do not have deflection here. It is, however, sometimes difficult to determine which portion of the loop is due to deflection and which is due to motion, because the straight portions may not always be so distinctly different as in Fig. 5.

The hysteresis loop is also a measure of damping in the system; in the case of vibration such load cycles occur but faster than can be obtained by push-pull tests.

Rigidity

Rigidity of a machine, with regard to deflection, may be taken as the ratio of

deflection to load. It is feasible to use 1000 lb. load as a reference load, and to determine deflections for 1000 lb. load. The distortion is usually the total distance from A to C; however, in

cases where deformation and motion shall be separated, the vertical branches B - B' and D - D' are subtracted from the distance A - C.

Some actual examples for rigidity data found by experiments may be quoted here: On broaching machines the deflection between column face and broach tool was .0025 in. per 1000 lb. load, when the load was applied parallel to the column face simulating the cutting load component occurring on a broach tool with shear. The deflection between worktable and tool was much greater, namely .0047 in. per 1000 lb. load. The admissible deflection will

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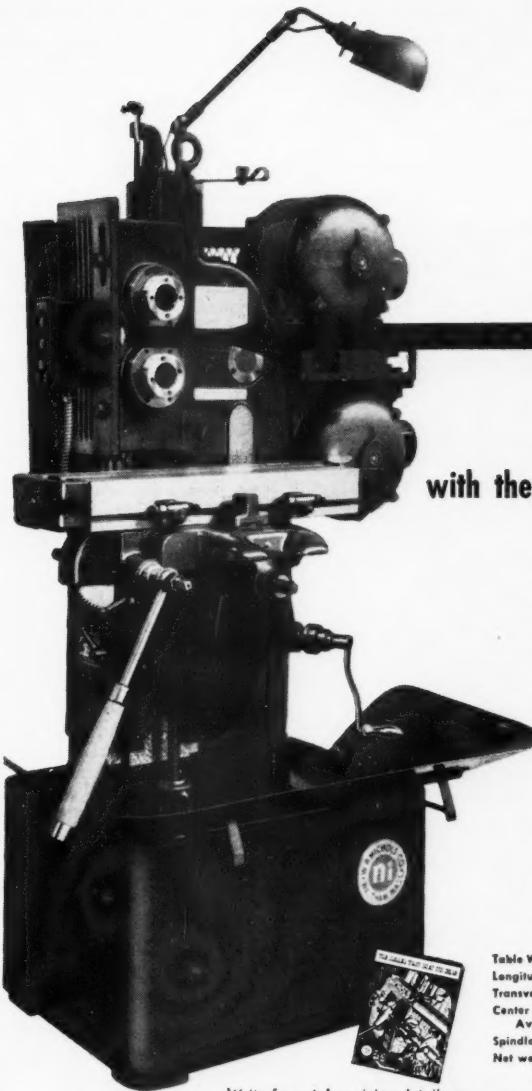
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naturally depend on the type of work that is being broached. As an example, in the case of broaching a complex contour, such as occurring on some vending machine parts, much less deflection may be admitted than in the case of broaching plane surfaces.

The effect of the tightness of gibs will be seen from some more data: With tight gibs the hysteresis loop did not have any of the straight portions and

the branches tilting to the right and the left joined each other. The deflection was only .0003 in. per 1000 lb. load. Turning the set screws two turns loose—as recommended by the manufacturer—resulted in a deformation which was 4 times larger, namely .0012 in. per 1000 lb. load. Another turn increased the deformation to .003 in. per 1000 lb. load.

On a horizontal milling machine, when feeding to the left, the knee deflection was .0037 in. per 1000 lb. while it was 3 times as large when feeding to the right, namely .010 in. per 1000 lb. Inspection of the machine showed that, in the case of feeding to the left, the load was directed against a solid dovetail, while when feeding in the opposite direction the load was on an inserted dovetail which deflected more than the solid one. Replacing the screws of the inserted dovetail by tightly fitted dowel pins reduced deflection substantially.

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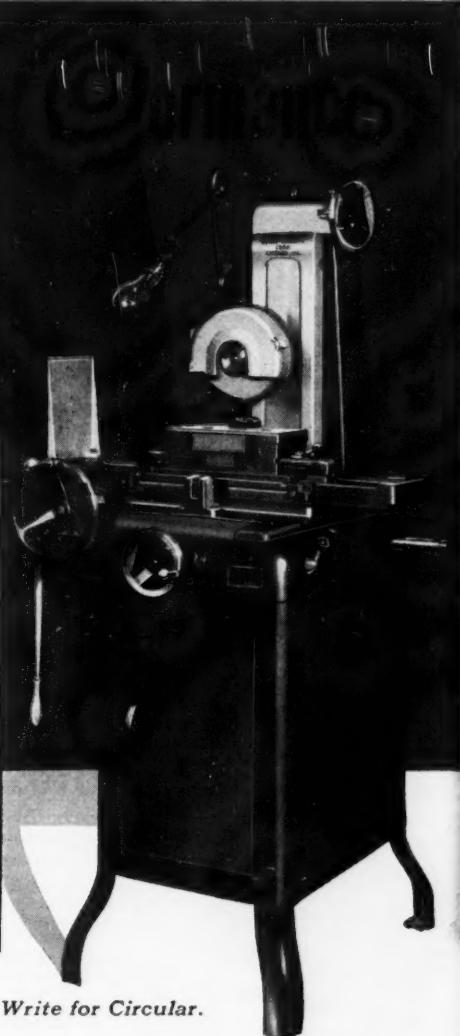
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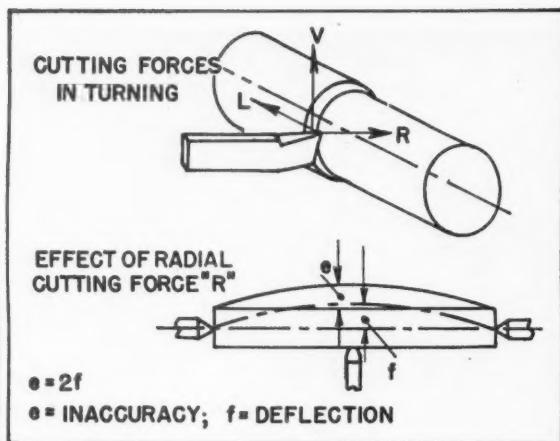


Fig. 6 — Upper sketch illustrates the three components of cutting force on a workpiece. Lower sketch shows effect of radial cutting force.

with a new motor, the tests indicated a deflection between tool and work of as much as .010 in. per 1000 lb. which is about five to ten times the deflection of a good new machine. In addition, a

substantial backlash was found. The compound rest and other parts were replaced by new ones which reduced the deflections substantially, although they could not be reduced to that of new machines.

Deflection of Workpiece

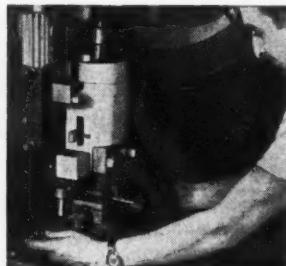
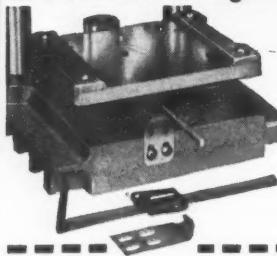
In addition to deflection of the machines it is also necessary to consider the deflections of the workpiece due to

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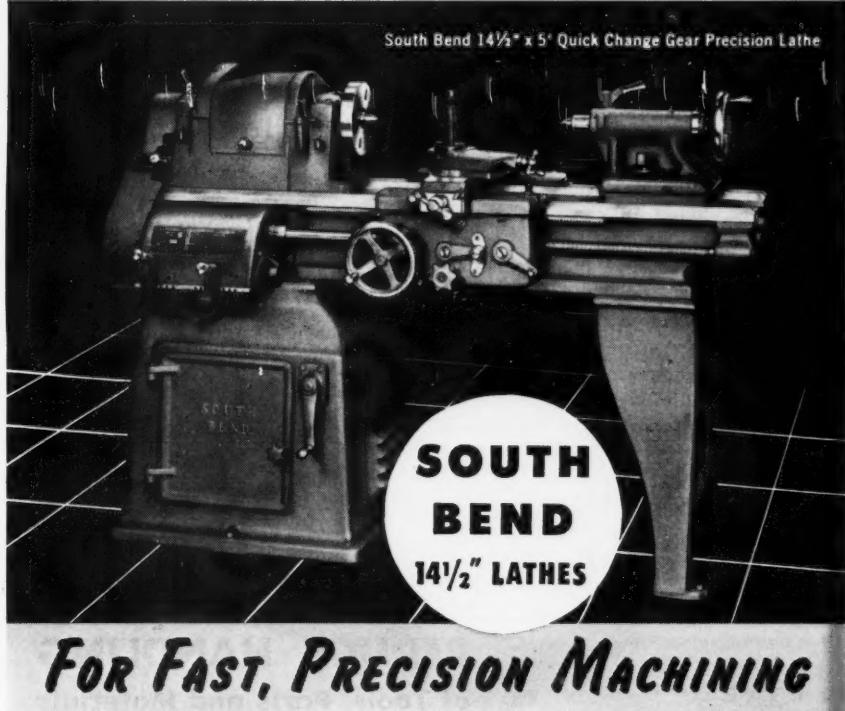
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the cutting force. The upper sketch in Fig. 6 shows the three components of the cutting force. The vertical force (V) which is usually the most significant one as far as HP, bed deflection, and so on, is concerned, has practically no effect on the deformation of the workpiece, except in cases of crankshafts and similar workpieces where torsion under cutting is appreciable. The horizontal force (L) acting in the longitudinal direction may likewise be disregarded in connection with work deformation. Hence, the horizontal force acting radially (R) is substantially responsible for work deformation, bending it, as shown in the bottom view Fig. 6.

The work diameter will be larger at the tool by an amount equal to twice the deflection ($e=2F$). The increase in diameter can be calculated, using a

formula based on the deflection of a beam on two supports:

$$e = \frac{R \cdot L^3}{12 E \cdot D^4}$$

Where:

R=Radial component of cutting force

L=Length of workpiece

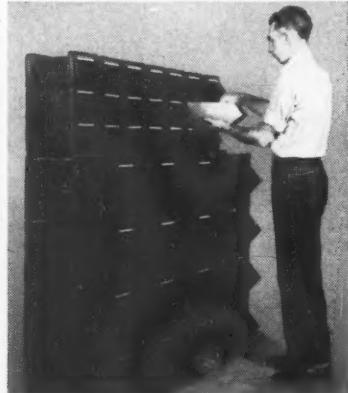
E=30 .10⁶

D=Diameter

If we assume a value of 1000 lb. for the radial cutting force (R), it will be seen that the following workpieces would be .002 in. heavier in the middle

than at the ends: $(D^4 = \frac{L^3}{72})$

Diameter	Length
2 inch	10 inch
3½	20
4½	30
5½	40



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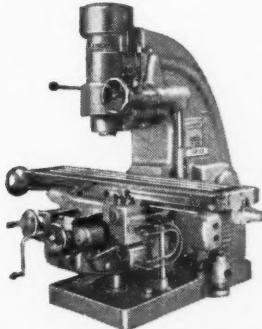
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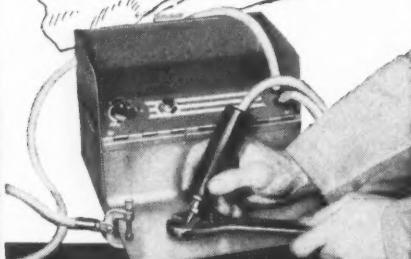
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It will therefore depend on the tolerances admissible for the workpiece as to whether such increase in diameter may be approved. These deflections may also be used as a guide for determining the distances at which steady rests should be set in the case of turning or grinding slender shafts.

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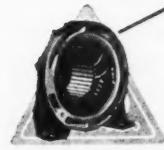
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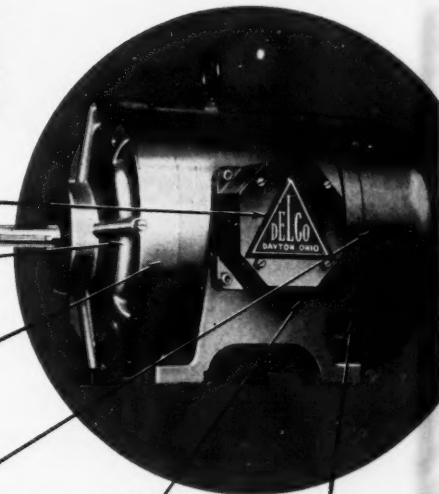
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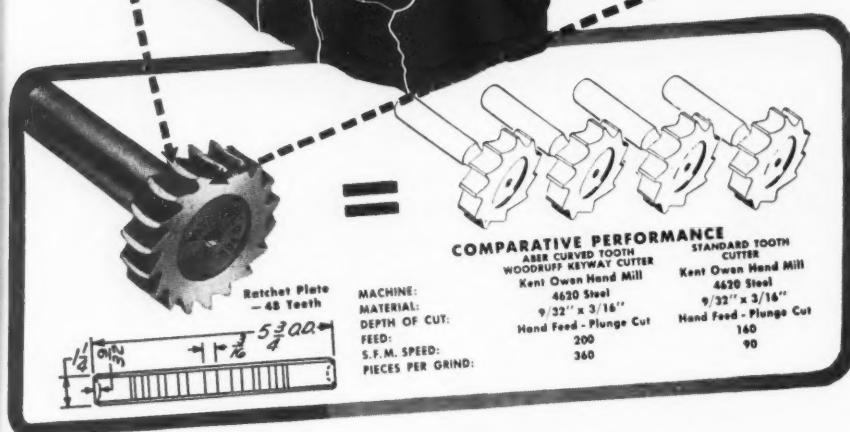
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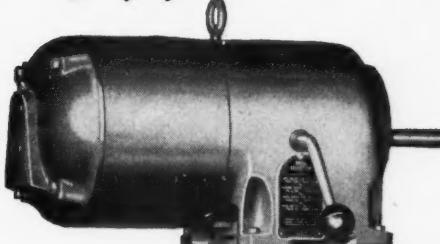
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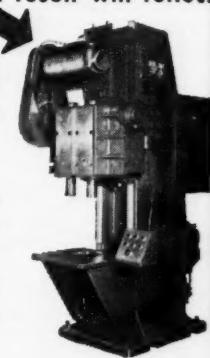


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Investigation at Northrop Aircraft points to wider application of routing on minor jobs.

By GILBERT C. CLOSE

ROUTING has always been considered a convenient general production process but, due to inherent characteristics of the average router equipment, it has never been considered a precision operation. In the aircraft industry, where routing is used extensively for trimming skin sections and cutting access holes and doors in large sheet material, tolerances in the neighborhood of .040-inch are usually specified. This tolerance is kept on the positive side so that when a close fit is required, further work can be ac-

complished on the routed edge. This work generally consists of hand filing at the time of assembly to secure a fit in compliance with blueprint requirements. This is a time-consuming operation.

With an eye to improving router precision and thereby efficiency, tooling engineers at Northrop Aircraft, Inc., instigated several investigations. The first to receive attention was the conventional radial arm router, many of which were in use in the Northrop shops.

It was established immediately that, despite the care used, tolerances closer than the average .040-inch were impossible using conventional methods of clamping, guide adapters, chucks, and the inverted taper shank cutter. Sub-

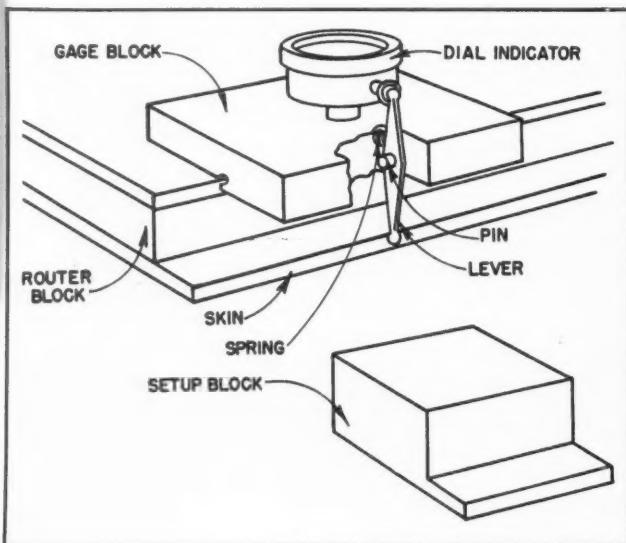


Fig. 1 — Northrop-designed gage block for checking accuracy of router cut.

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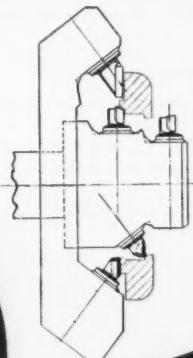
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stitution of the old standard $\frac{3}{8}$ -inch diameter single flute router bit, used extensively on pin routers, was tried and gave somewhat better tolerance results.

The next step was to design a new guide adapter that would hold the sheet

ently close to permit trimming of skin and wing sections for direct assembly without intermediate hand work.

To supplement this type of work, and provide a quick and easy method for checking accuracy, the gage block assembly illustrated in Figure 1 was de-

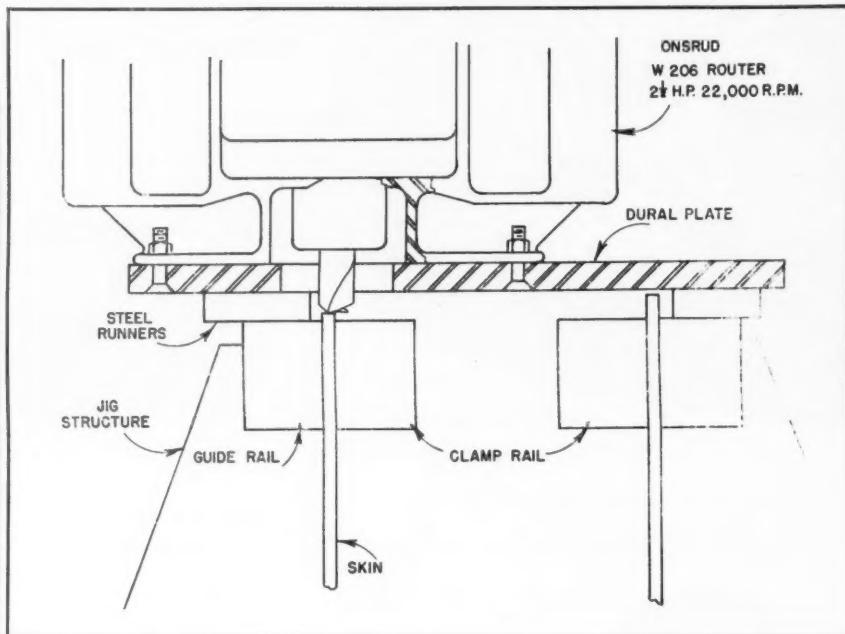


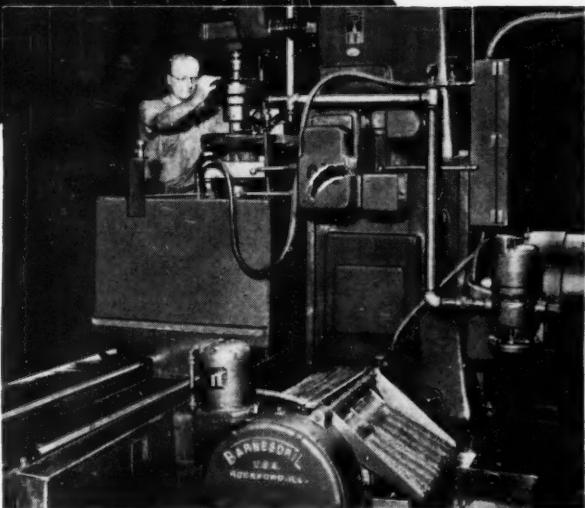
Fig. 2—Fixture for endmill method of routing sheet edge.

to be routed more firmly and closer to its edge. This adapter gave solid clamping within .375-inch of the cut. The third step was to try out various chucks that would hold the cutters in more precise alignment. Of the various chucks tried, the Erickson Precision Chuck proved best. With the radial arm router thus equipped, it proved possible to consistently obtain router cuts with a precision tolerance of not more than .005-inch. This was suffici-

signed and built. This gage block serves three purposes, i.e.: (1) to check the first few inches of router cut for the required plus-or-minus .005-inch tolerance; (2) to check cutting size of router bit; and (3) to check finished router cut before removal of the sheet from the router block.

After a period of production with this modified router equipment, it was noted that a substantial saving in router bits accrued by having eliminated the

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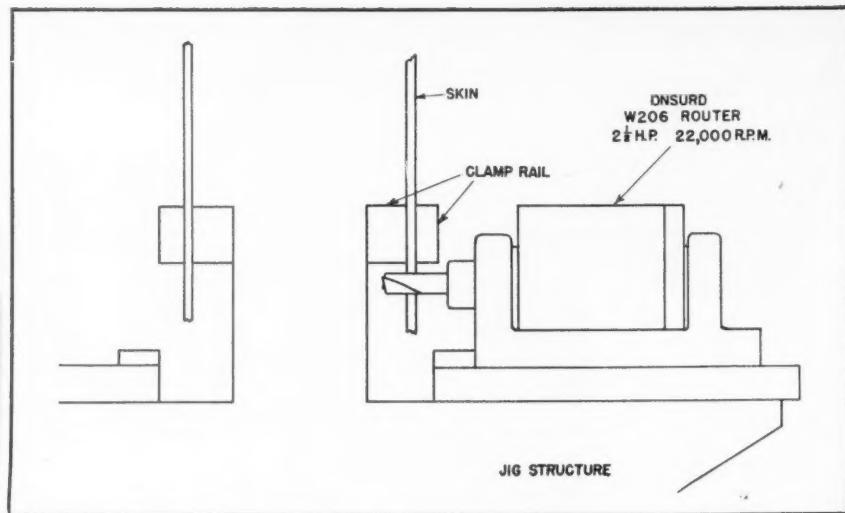


Fig. 3—Fixture for cut-routing with cutter perpendicular to sheet.

special inverted taper bits, replacing them with the straight-shank double end bits already standard on the pin and stationary routers.

In practice in the Northrop shops, no attempt is made to obtain the .005-inch tolerance unless it is specified on the blueprint. To save time during run-of-the-mill router work, the old .040-inch tolerance limit is still permissible. But when a precision butt joint is required,

it can be obtained using the above described set-up.

The second facet of the Northrop router studies had to do with obtaining the very close router tolerances required for skin sections used in the wing leading edge assembly on their high-speed F-89 interceptor airplane. These skin sections are much heavier than usual, varying upward to .156-inch in thickness. Hand-filing of the routed

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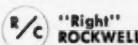
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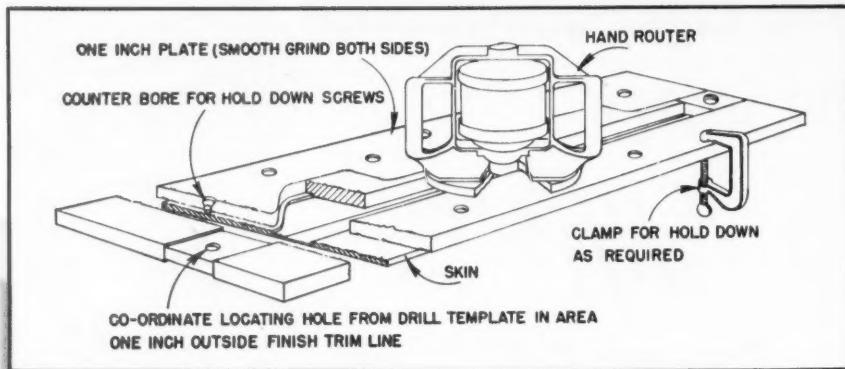


Fig. 4—Fixtures to permit precision routing with hand router.

edges during assembly had been used to obtain the necessary close fit.

Two fixtures were designed as shown in Figures 2 and 3. The fixture shown in Fig. 2 for routing endmill fashion

included an Onsrud "W206" router and 2½ H.P. motor operating at 22,000 r.p.m., plus a .625-inch diameter two lip cutter. The second fixture, Fig. 3, permitted the same equipment to be used

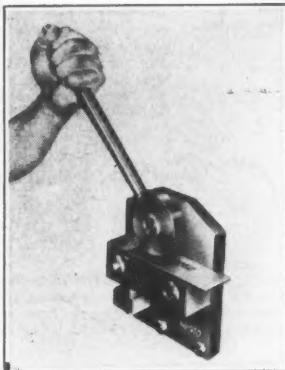
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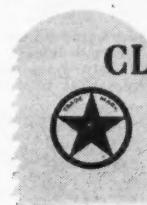


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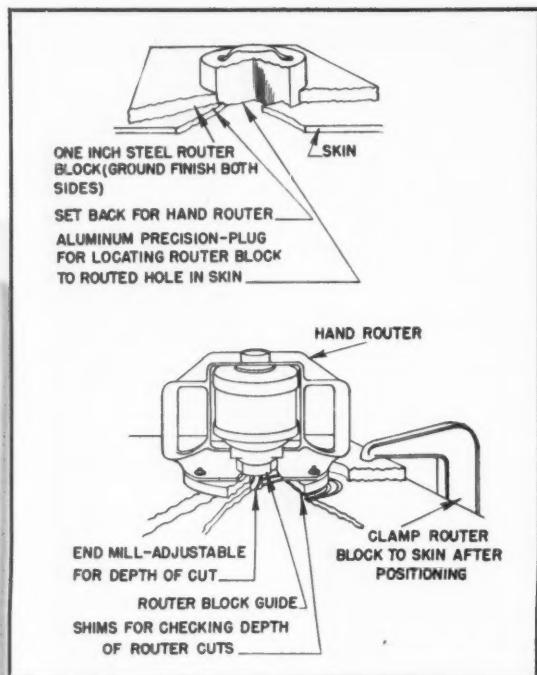


Fig. 5—Details of hand router and hand routing tooling.

lar to the sheet, one pass was used to obtain size.

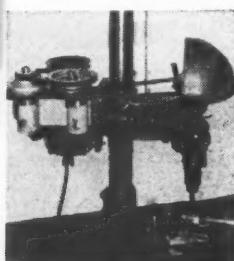
In results, the endmill fashion of cutting proved very good. A good machine cut could be made and held to within plus-or-minus .005-inch of the rails used. The amount of material that can be removed in a single pass provides a good production rate.

The cuts made perpendicular to the sheet, as shown in Fig. 3, could not be held to such close tolerances. While this method is satisfactory for making door cutouts, and so on, the conventional radial arm router will give equal results and is faster. Either method requires good solid clamping of the material within .375-inch of the sheet. The cutter should be offset from the material enough to make a good climb advance into the cut for best results.

A third facet of the router studies

in cutting into the sheet with the cutter perpendicular to the sheet surface.

When operating endmill fashion, it was found that as much as .75-inch of material could be removed from the .156-gage sheets, and .625-inch of material from the .050-gage sheets, in a single pass. When cutting perpendicu-



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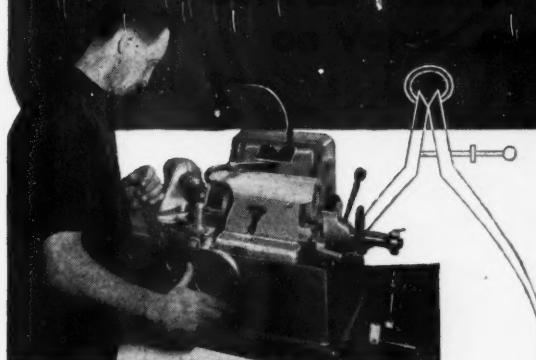
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Fig. 6—Hand routing a step cut in an airplane wing panel.

had to do with the possibility of hand routing to very narrow tolerances. The object of this investigation was to develop an inexpensive method for milling step cuts in the edge of wing skins, stepping the edge of skin panels to match mating parts, and trimming the edge of formed parts. This work had been accomplished on a large horizontal boring mill or a large Hydrotel, with the set-up and job requiring from 3 to 8 hours.

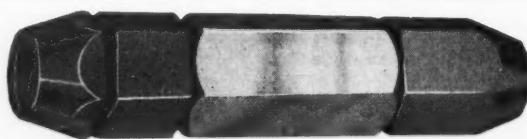
In this type of work, tolerances had to be held within plus-or-minus .005-inch on the depth of cut, and plus-or-minus .010-inch on the edge of the cut.

Several types of hand routers were tried during the initial phase of this work. The one that proved best was a Quackenbush 1.5 H.P. operating at 18,000 r.p.m. The cutter finally selected was a 1-inch diameter high-speed type with two flutes. The chuck on the Quackenbush router will accept cut-

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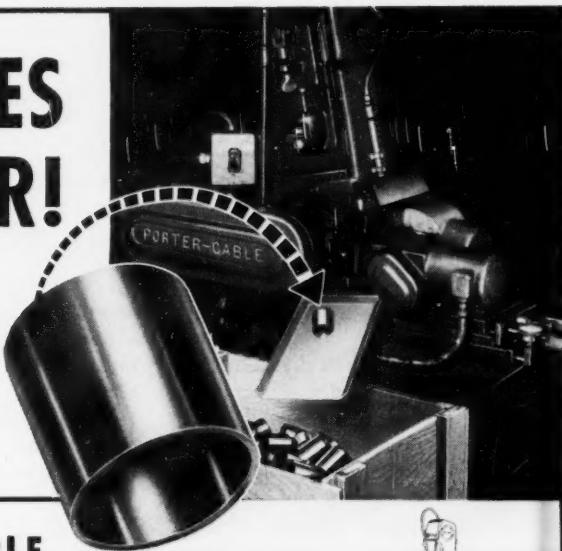


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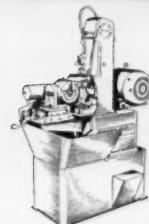
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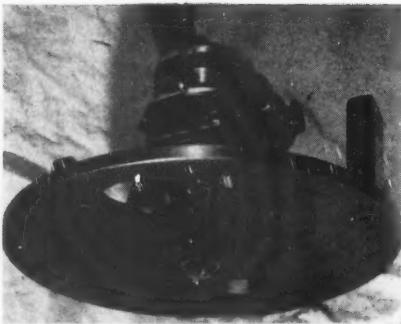


Fig. 7—Nether view of the Quackenbush hand router, showing two-fluted one-inch cutter, and plate for adjusting depth of step cut.

ters up to $\frac{1}{2}$ -inch shank diameter, and the motor has ample power for the 1-inch cutter. The depth of the cut is very readily adjustable by means of a threaded ring around the motor.

To use this equipment and obtain the

tained. Thus minor step-cut milling jobs on large parts that formerly required up to 8 hours on a large and expensive machine, can now be made in from 5 to 10 minutes on the simple equipment illustrated. Here again, in actual practice, no attempt is made to adhere to such close tolerance requirements unless they are specified on the blueprint.

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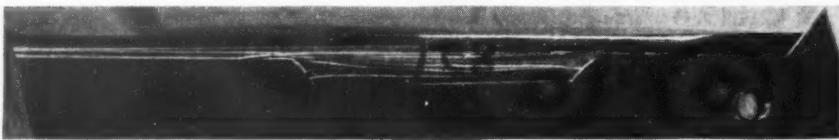


Fig. 8—Milled appearance of sheet edge after hand routing to tolerances within .005-inch on depth of cut and .010-inch on edge of cut.

necessary control over tolerances, the tooling described in Figs. 4 and 5 was developed and built. Using this set-up, step cuts entirely within the tolerance requirements could be consistently ob-

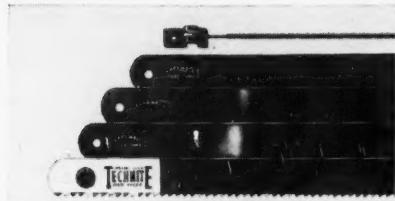
chine equipment to accomplish relatively minor jobs. A careful study of the situation such as the Northrop studies that resulted in increased efficiency of the router, and use of the hand router

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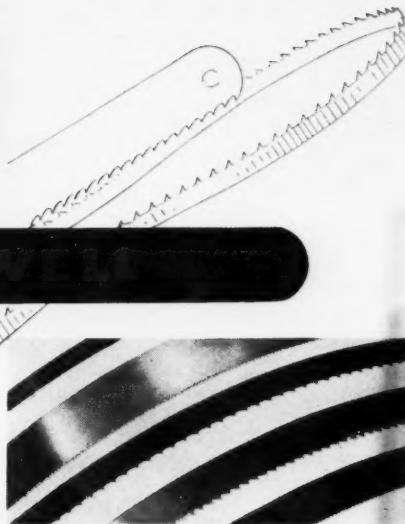


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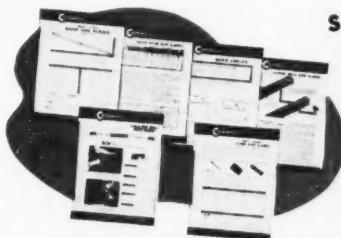
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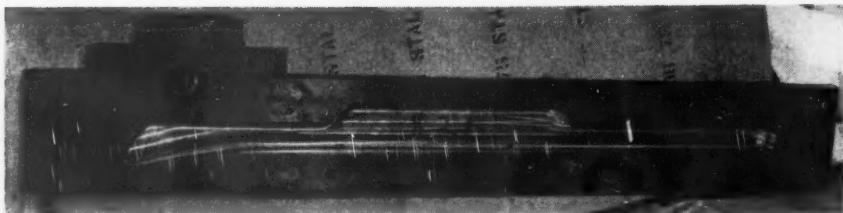
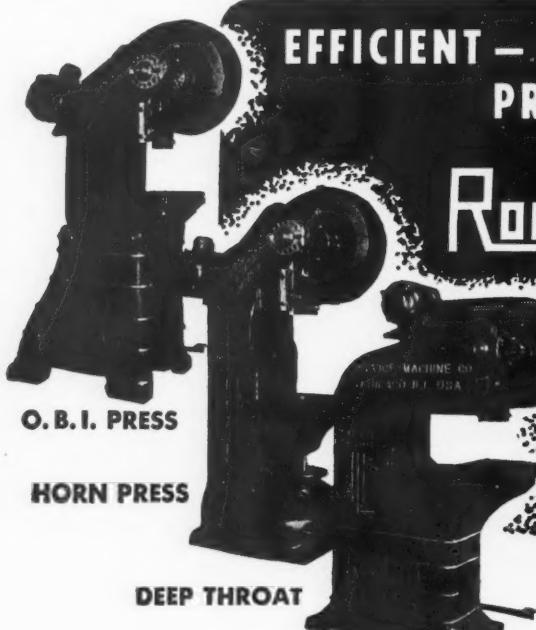


Fig. 9—Guide used in routing cut shown in Fig. 8.

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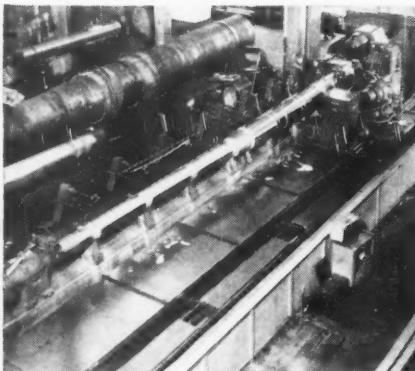
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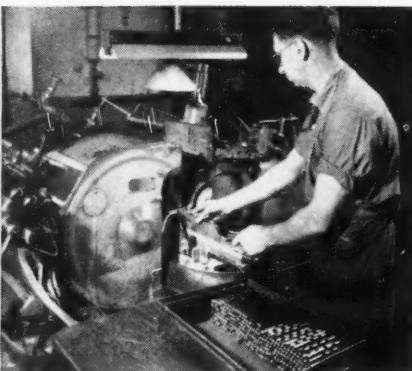
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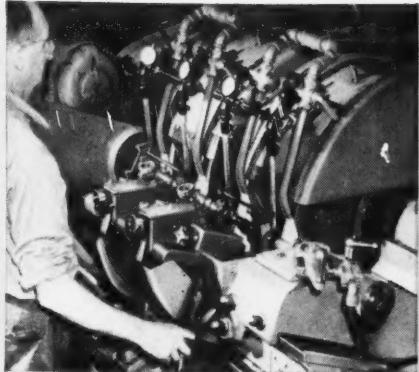
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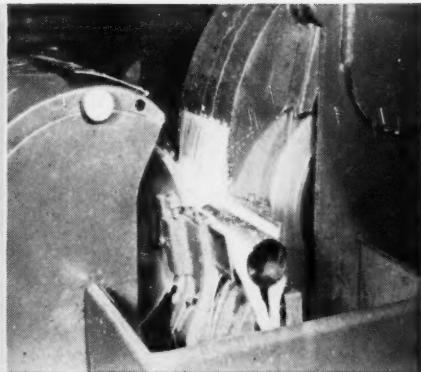
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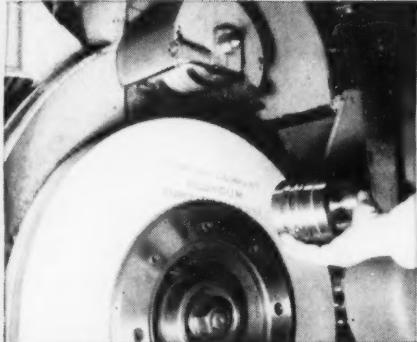


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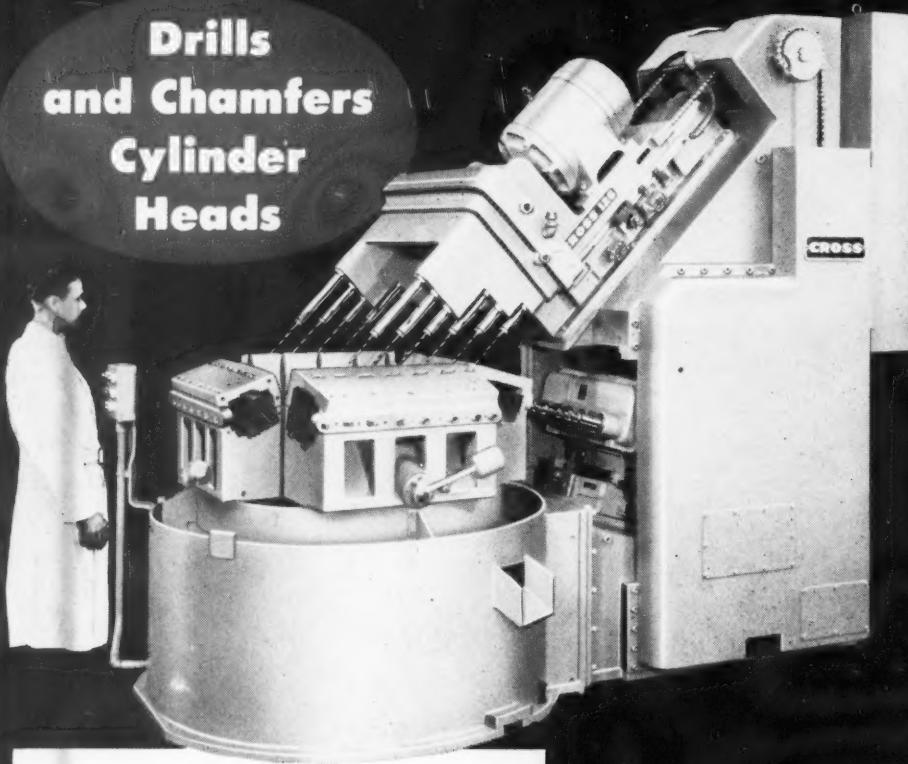
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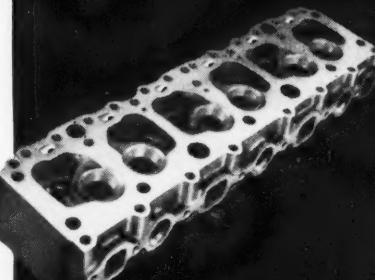


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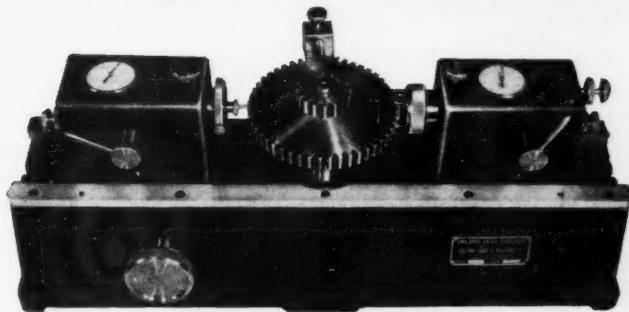


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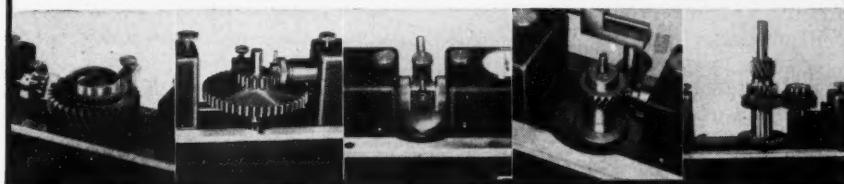
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Caterpillar Tractor Company has highly organized community relations program.

By BARTLETT WEST

YOU know lots of people who are good neighbors—housewives who bake a cake for the family of a sick mother, men who mow the lawn of their neighbor who's on vacation. Such neighborliness, when practiced by a large industry, is called community relations. In Peoria, Ill., Caterpillar Tractor Co. has become known as one of the best neighbors any community could have.

Briefly, here are some of the ways through which the company maintains a friendly and helpful relationship in its community's civic, church, social, and educational circles:

(1) It invites folks in to see its plant so they may know more about the job of manufacturing tractors, engines, and

earthmoving machines.

(2) It regularly mails company magazines and other literature to 6500 community leaders.

(3) It supplies speakers, motion picture films and equipment, and other program material to luncheon clubs, PTA's, and similar organizations.

(4) It donates the use of earthmoving equipment and manpower to churches, schools, and such groups as the Girl and Boy Scouts when a playground needs to be leveled or a new basement dug—and when no funds are available for the work.

(5) Company personnel take an active part in the activities of many civic committees, professional groups, or such service clubs as Rotary and Kiwanis.

(6) And the company donates a sizeable sum of money each year to charitable groups, hospital funds, and organizations whose work serves a wide segment of the community where Caterpillar people live.

All of this activity implements the three basic objectives of the program: to keep the community correctly informed about the company, to work with the community's people in civic affairs, and to foster a friendly, sympathetic relationship between community and company.

Caterpillar's plant tours, for instance, bring more than 10,000 men, women, and youngsters within the plant's walls every year. Guests include grade and high school pupils, college students, farmers, businessmen, housewives, government officials, and many visitors from overseas. Most of the visitors are not only impressed with the plant's cleanliness, but express wonderment over the number of men and machines

it takes to build the company's products.

Not only does the company receive many a "thank you" note from visitors who have enjoyed the tours, but it has also hired several college students who first saw the plant during a tour; and plant tours have even been credited with playing a major role in selling a tractor, engine, or motor grader.

As Fred R. Jolly, community relations manager, puts it, "Our dealers often bring customers to the plant to show them how Caterpillar products are made. Not infrequently we learn later that the customer was so impressed by the precision work he saw that his tour figured prominently in his decision to buy a piece of equipment."

Although many casual visitors tour the plant, most of the 10,000 guests a year come in groups which have received special invitations. Such groups have included barbers, ministers, and members of the editorial staff of the

Typical of the earthmoving jobs Caterpillar does, without charge, for various groups in its community is the digging of a basement for a new church.





Plant tours arranged by Caterpillar attract more than 10,000 visitors annually. Here a group watches operations on the tractor assembly line.

mile radius of the factory. In addition, other mailings to this group cover any topic of special interest within the plant, or an outstanding piece of literature about America's economic system and its vital role in the growth of a free country. At the same time, most of these mailings are also going into

the homes of the company's 27,000 employees.

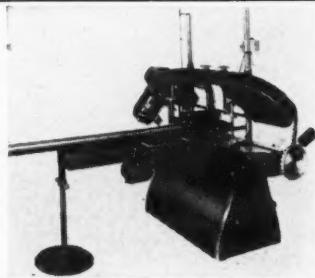
Nearly a thousand programs a year are arranged for area organizations by the department. In a typical two-month period, 16,667 persons gathered in community halls and church basements, made use of Caterpillar motion

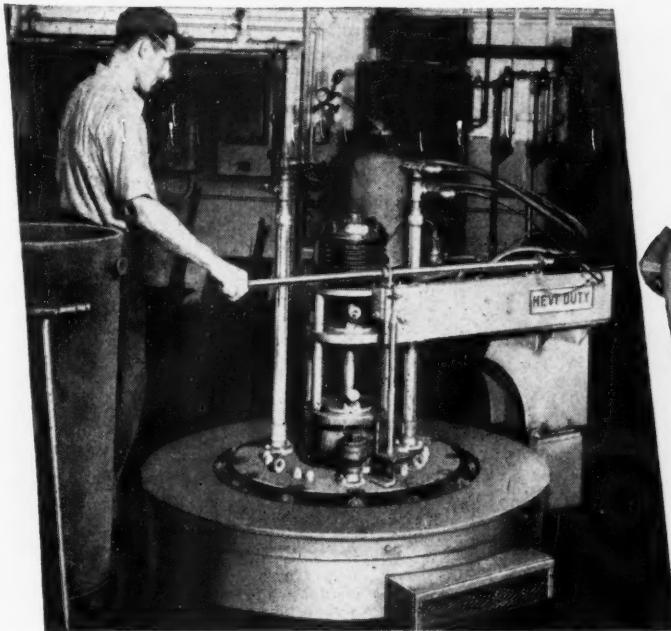
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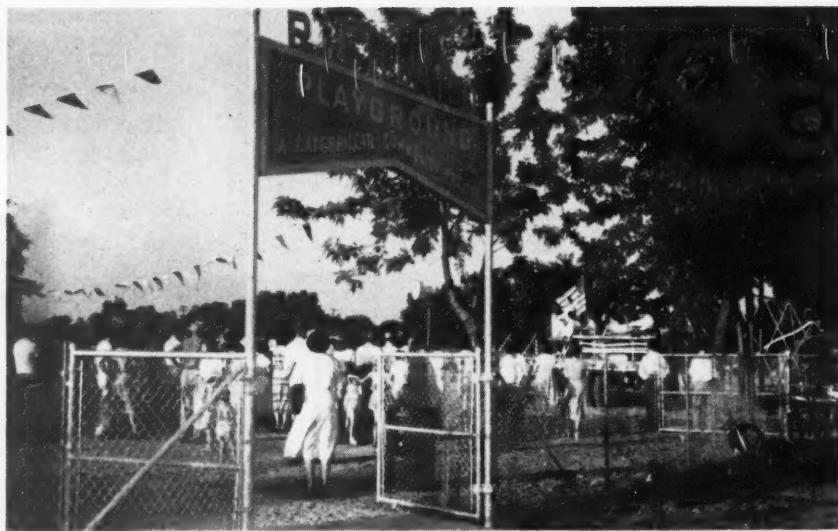
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A complete playground was built by Caterpillar for a residential area which is located in the midst of the company's many buildings.

picture projectors, mikes and amplifiers, slide films, and record players. Or they heard a Caterpillar employee speak on such subjects as export trade, research, and advertising.

"There are only two limitations on the service we offer," Jolly said. "These are that the organization be within the area where Caterpillar folks live, and that there be no admission charge for any program where our equipment,

films, or speakers are used. The happy thing about these limitations, of course, is that literally hundreds of organizations can keep within them."

Closely tied in with this aspect of the department's work is the earthmoving program for churches, schools, and other groups. Jobs have included relocating a creek bed in a city park, grading athletic fields, building roads, digging basements. All are done with



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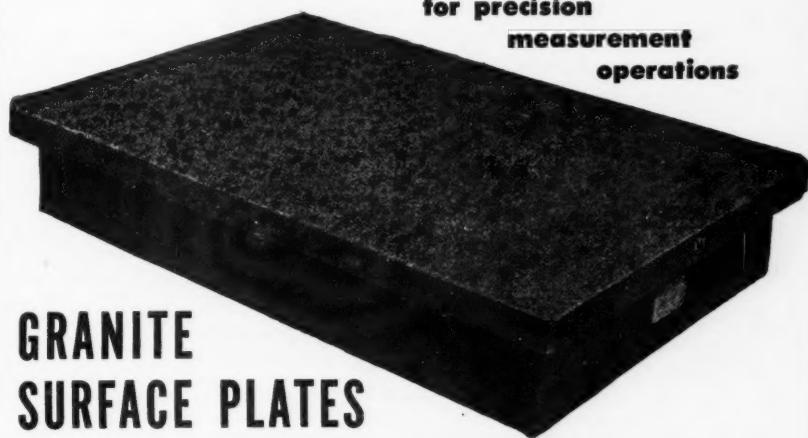
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approval of local contractors and the local International Union of Operating Engineers.

One of the principal factors in encouraging the participation of company personnel in civic and society affairs is the attitude of Caterpillar management. It is known throughout the company that work on such activities as Red Cross or Community Fund drives is considered by management as a vital

part of the company's community relations program. Supervisory employees gain the full cooperation of management in finding time and energy to do a community job well. Other employees are likewise encouraged to participate in their community's affairs.

In 1950 the company contributed well over \$100,000 to 49 character-building, health, welfare, cultural, and educational organizations as well as to business,

education and research associations. This did not include, however, any capital fund contribution such as the company's \$500,000 in gifts to various area hospitals during the period of the past three years.

The company has formulated a certain few fundamentals for use in evaluating requests for donations. It uses them as guides in determining the organizations which may be eligible for contributions. Caterpillar employees, acting as individuals, also contribute very generously to various charitable groups.

Many other activities keep com-

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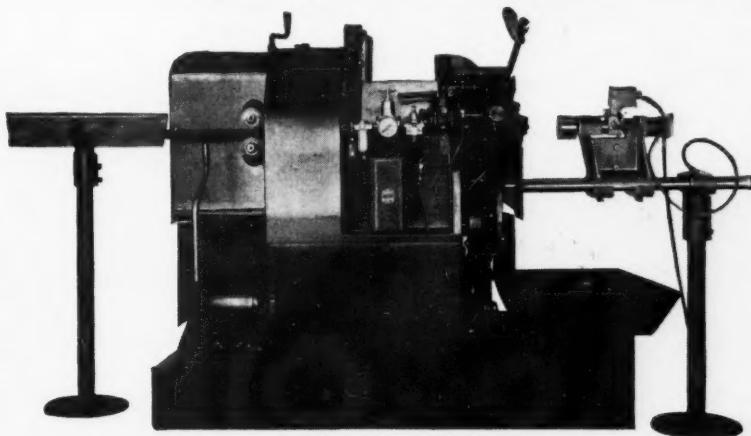
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Shown here is a scene taken during the formal dedication of the complete playground built by Caterpillar for a residential area which is located in the midst of the company's many buildings.

munity relations personnel busy. Timely messages about company activities, or in support of some community project, are displayed periodically on truck-side cards. Public information ads about such topics as the annual report, the function of management, or the 19,000 stockholders who own the company are prepared for local papers and the employee magazine. And the department cooperates annually in helping plan and successfully execute such programs as city festivals, Farm Youth Day, Crusade for Freedom, and other general interest events.

Complementing this program is the company's close cooperation with the daily and weekly press and radio stations in disseminating news about all company activities. Hardly ever is one of Caterpillar's releases not printed, because information is only released when it can be considered as legitimate news rather than "a publicity puff."

Although Caterpillar believes it has made better-than-average progress in developing a community-wide understanding of the company and a friendly attitude toward it, community relations personnel can hardly be called "satis-

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fied" with their program. Jolly has just recently completed a survey of the 6500 persons on the "thought leader" list, in an effort to learn how effective his mailings are, how they can be improved. And the over-all program is constantly being studied and refined with an eye to keeping it in step with the constant growth of the company itself.

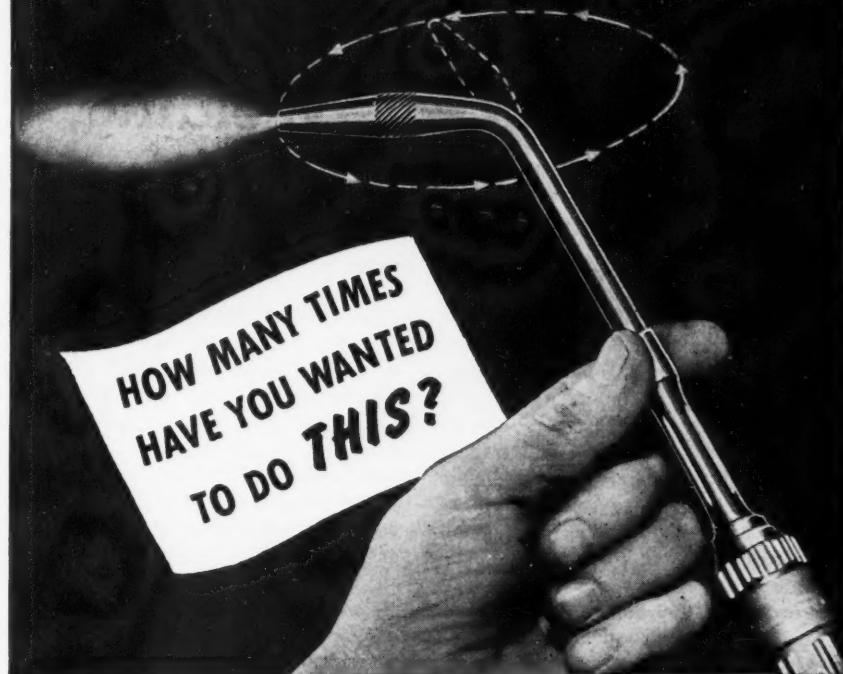
The department fully realizes that the success of its program "depends upon the wholehearted support of folks all the way through our company," Jolly said. That it actively encourages a continuation of this support—and is successful in getting it—is one of the most important bulwarks of the program.

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Simple Back-Up Device Facilitates Arc Welding Of Box Sections

By H. G. FROMMER

THE sketch presented at the left in Fig. 1 shows a design of box section weldment dating back approximately 15 years as produced by a particular company for use in the manufacture of a rather low volume product. The section was made by joining two structural channels to two flat plates by hand arc welding. This method of fabrication was quite simple and efficient for those times when riveting was the order of the day. However, the demand for the product recently increased to such a point that the company decided to modernize and simplify the design of the weldment to allow for high volume manufacture. This new design of weldment is shown

at the right in Fig. 1.

In producing the newly designed weldment, standard steel plate is sheared to the proper length and width on a recently installed 12-foot power shear and then formed to the desired shape with a press brake, also installed by the company within the past few years. The box section is welded in one pass (each side) through the use of a fully automatic submerged arc welder. In welding the section, however, an air-operated device is required for backing up the weld joint with a copper strip to prevent "blow-through." Such a back-up device is shown in Fig. 2.

The device includes an air cylinder to force the copper back-up bar (13) against the inside surface be-

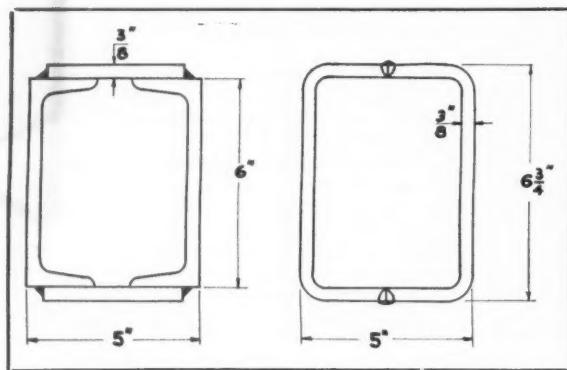


Fig. 1—(Left) Old design of box section weldment produced by joining two structural channels to two flat plates by hand arc welding. (Right) New design of box sectional weldment produced by shearing standard steel plate to proper length and width, forming on a press brake, and welding in one pass (each side) with a submerged arc welder.

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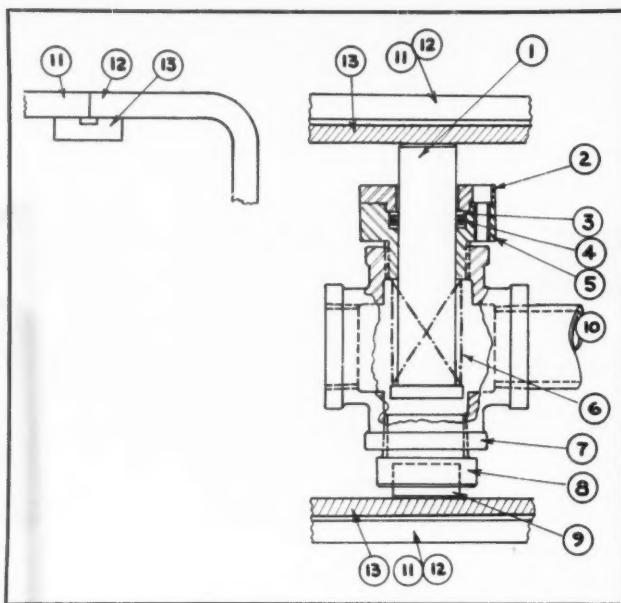


Fig. 2—Sketch of air-operated back-up device used in arc welding joints of box section shown at the right in Fig. 1.

neath the joint made by the two component workpiece (11) and (12). To permit flexibility of use of the back-up device on a variety of weldments, the air cylinder is built into a standard pipe "cross" (7) which is connected to similar air cylinders and pipe crosses by sections of standard pipe (10). A flange (5) which is bored to slip fit with the plunger (1) and counterbored for a standard O-ring (4) and leather rings

(3) is screwed into the pipe cross. Fastened to this flange is a cap (2) to retain the O-ring. A spring (6) provides for return of the plunger after the air is exhausted by a standard four-way valve which is used to operate the device. The lower end of the cross is designed to accommodate a pipe plug (8) with removable button (9) that provides flexibility of design for various workpieces.

Any practical number of cylinders may be connected together with various lengths of standard pipe, as shown in Fig. 3. Obviously, the last cylinder must be closed off to prevent escape of the compressed air.

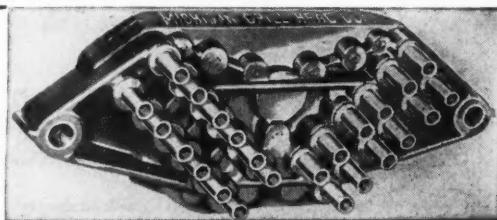
The operation of the back-up device

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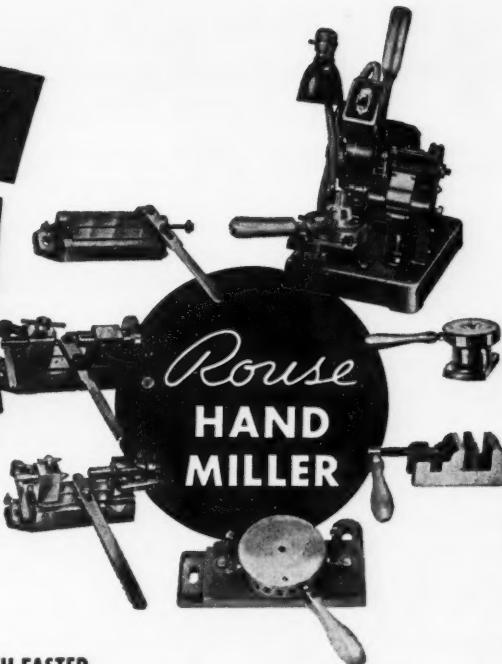
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Fig. 3—Illustration showing how any practical number of back-up air cylinders may be connected together with various lengths of standard pipe. The standard four-way valve shown at the extreme right is used to control the system.

is quick and simple. The two workpiece components are placed in a holding fixture which serves to locate and hold the pieces from the outside. The back-up device together with the copper back-up bar is slipped into the space formed by the workpieces. Upon opening the air valve, the plungers of the cylinders force the copper back-up bar against the underside of the joint, providing firm support while the submerged arc welder is employed to weld the joint. This series of operations is repeated in welding the opposite side of the box section.



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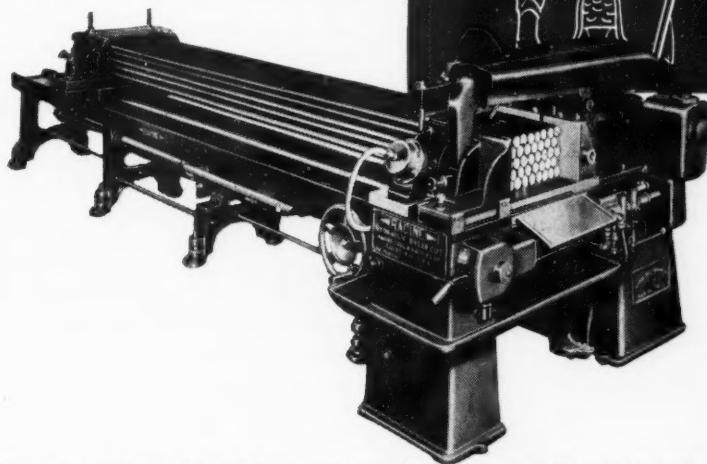
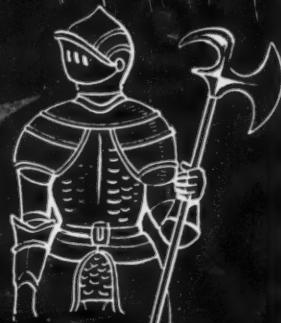
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Faster Press Operations

In which the author describes several interesting operations that are being performed on hydraulic press equipment.

By C. W. HINMAN
Designing Engineer

DURING the past few years, a number of hydraulic presses have been developed which combine the desirable features of compactness and fast operation. Some of these presses are available in a wide variety of types and sizes. Hydraulic presses are well adapted to operations such as light drawing, necking in, staking, tensioning circular saws, assembling work parts, crimping, riveting, and a large variety of die work.

An excellent example of presses of the compact and fast operating variety are those designed and built by Denison Engineering Company whose presses are available in eight sizes ranging from one to fifty tons capacity.

An important feature of hydraulic presses, especially for assembly work, lies in the fact that stroke is not fixed. In other words, if work parts vary slightly in size due to previous operations or varying thicknesses of metals, no harm is done by the hydraulic ram when it descends. Mechanically fixed

stroke action provides uniform travel of the punch without variation, but the hydraulic ram descends and exerts pressure regardless of work variation because the resistance of the work must be contacted before pressure is built up in the hydraulic system. Therefore, work parts may vary greatly without damage to the press or dies and still the work is properly assembled.

Drawing Aluminum Binocular Bodies

A forming or necking operation on aluminum binocular bodies is illustrated in Fig. 1. This operation is being performed in a Denison 4-ton Multipress. The lens frame is blanked and formed from light gauge brass stock, as shown in Fig. 2. These two operations are performed by use of a compound die, in progressive steps, with blanking and forming being completed with each cycle of the ram. After the frames are painted, a felt ring, for protection of the lens, is crimped into the frame. After the body has been machined, the

Fig. 1—Illustration showing method used to form aluminum binocular parts. Blank is shown in right foreground and drawn part at right.

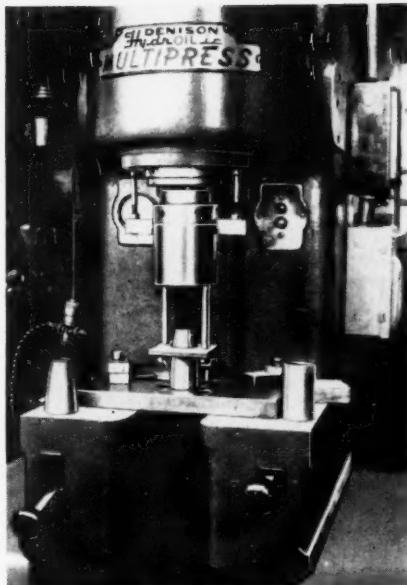
binoculars are assembled in a single operation on the press. The hinges which hold each housing are assembled to the center post by means of a flaring operation.

Since the method selected for forming and assembling permits quick and easy tooling changes, and uses only one machine for several operations, production output on this job has been greatly increased. Small lots of 200 pieces are produced at one time. Using the Multipress for the majority of operations reduces equipment costs to a minimum. As a result, these binoculars can be priced to compete with ordinary production line field glasses. Five major operations are all that were required to complete the job.

Assembling Ball Bearing Cages

Figure 3 illustrates a Multipress operation and the six station dial table on which the operator locates the component parts of ball bearing cages. Figure 4 illustrates the two principally used methods for fastening the cages together—clinching and riveting. Fig. 5 shows a drawing of the simple die setup which is used for the riveting operation.

The multiple riveting operation is performed by fitting the dial with six



sets of dies corresponding to the six stations of the dial and a single set of punches attached to the press ram. The bearings, with the two halves of the retainer and unheaded rivets in position, are placed on the dies at the front station of the dial, directly opposite the press ram. The completed assemblies are taken off the dies after the dial has indexed to the next position past the press ram. This feature gives greater safety of operation—at no time does the operator have her hands near the ram. The lip-clinching operation is done in the same manner as riveting, but

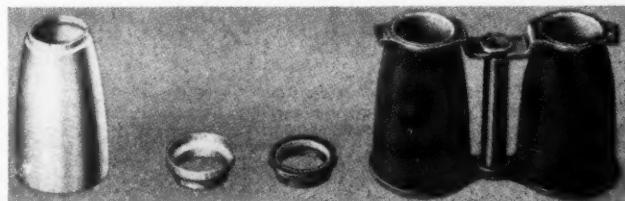


Fig. 2 — Illustration showing binocular parts in the blanked, drawn, necked, formed and assembled stages.



Fig. 3 — Ball bearing cages are either riveted or clinched in a setup as shown here.

Production has shown a 40 per cent increase over equipment previously used for these two operations. The outstanding feature of this application is that the Multipress with its exact pressure control provides greater uniformity of assembled parts with greater

with a different set of punches and dies.

production over the method previously used. Another important advantage

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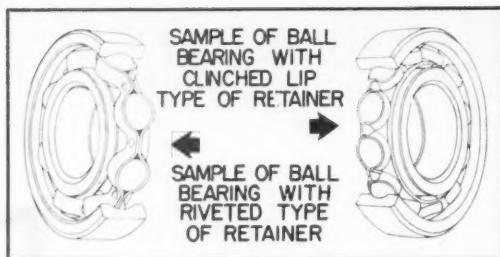
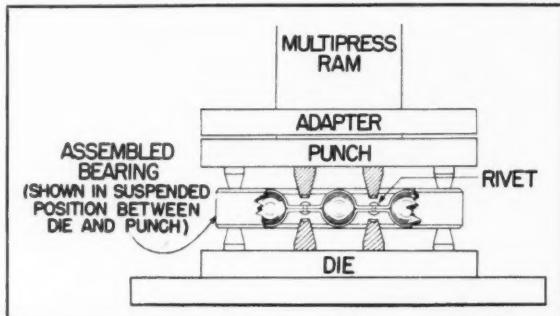


Fig. 4—Drawing showing two methods of fastening ball bearing cages.

gained is the setup time saved when changing from one type of operation to the other. A six station crimping die is illus-

of the thin walled electrode tubes, this operation was formerly handled on a manual type press. Correct pressure during assembly was entirely dependent upon operator skill. The operator, after becoming familiar with his task through

Fig. 5 — Drawing showing section through riveting die.



trated in Figs. 6, 7, and 8. Because of the off-size dimensions of many ceramic parts and the fragility

trial and error, was able to produce about 15 finished pieces per minute. However, due to the fatigue element, an operator could average only 6,000 pieces per day. When a Multipress was tooled up for this job, the production rate increased more than 100 per cent. The metal electrode tubes were "hopper-fed" to the operator, who placed



Fig. 6—Illustration showing six station setup designed for crimping metal electrode tubes to ceramic insulators.

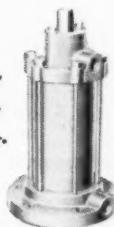
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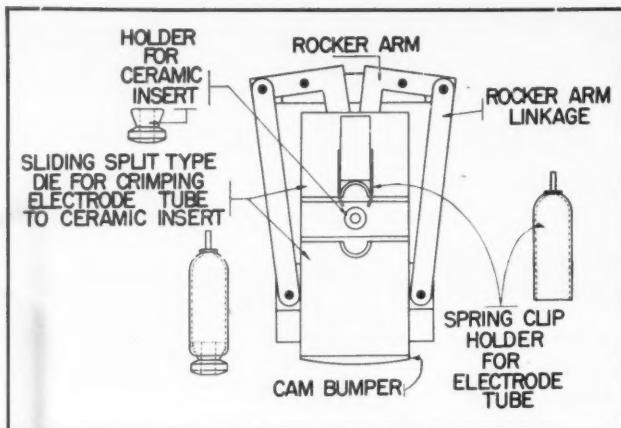


Fig. 7 — Drawing of crimping mechanism used in crimping metal electrode tubes to ceramic insulators.

the ceramic insulator on the tube and into the holder, at each station of the dial. One operator can easily produce 40 completed assemblies per minute, or approximately 15,000 per day, using a

2-inch stroke of the press ram. To reach this rate by means of the previously used method, three operators would be required.

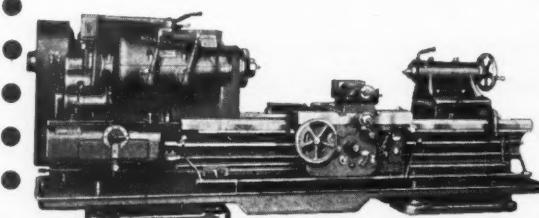
The tooling for this job consists of

three major parts: (1) A spider ejection mechanism, (2) Six cam operated sliding split-type crimping dies, and (3) A die closing cam. As the completed electrodes are ejected by the spider

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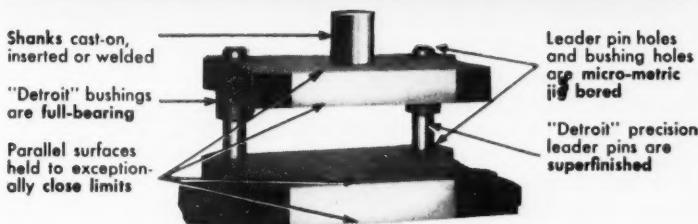
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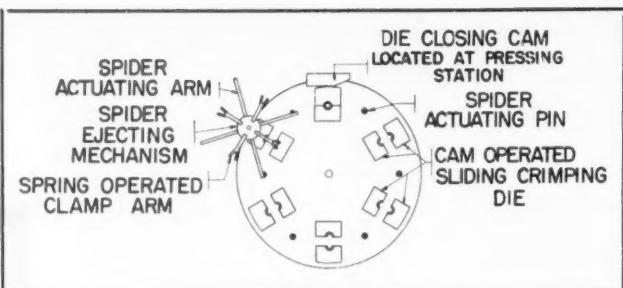


Fig. 8 — Top view sketch of six station crimping setup.

mechanism, new tubes and ceramic inserts are placed into their respective holders and are automatically indexed to the pressing station. At this point, the die contacts the closing cam, and is forced together around the ceramic insert. The ram then descends, pressing the tube downward into the die and crimping it to the insert. The spider ejection mechanism is attached to the ram banjo. When the ram descends the mechanism is pushed downward

against spring tension to a pick-up position where the clamp arm grasps the completed electrode. As the cam rises, the mechanism is raised upward by means of the spring which lifts the electrode from the die. When the ram cycle is ended, the dial indexes, causing the spider actuating pin to strike the spider arm—revolving it in synchronization with the motion of the dial, until the next index station is reached and the completed electrode is dropped into a tray located on the side of the table.



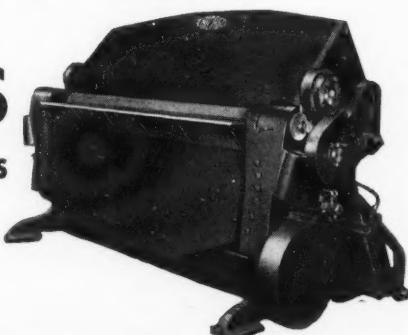
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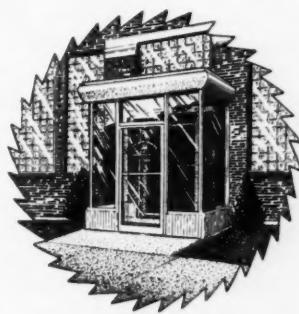
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Little Chats On Practical Psychology

No. 6—Can You Get The "Silent" Worker To Go Along With You?

ONE of the most difficult of all types of workers to handle is the silent man or woman who neither agrees nor disagrees with you; who goes about the job each day in an uncommunicative and unresponsive manner. When you explain a job or show this worker what you want done, many times you get the feeling that you have been talking to yourself. It is never quite clear whether this person is extremely shy or simply unwilling to talk at all.

This worker refuses to "open up" to your attempts at friendliness. He or she often displays a poker face, leaving you very much in the dark as to what he is thinking. Don't let this worker aggravate you to the point where you lose patience with fumbling around for a conversational opening. The difficulty with this man is that he may actually be shy, timid, retiring, may be worrying or annoyed with something and keeping his mouth shut by will power,

or he may simply be a very capable and alert individual paying close attention to everything you say and analyzing it carefully as you go.

There are many people in this world who are silent because they are thoughtful and not given to many words. There are many others who gain a reputation for intelligence because they are smart enough to avoid betraying their ignorance in words. When you meet someone like this, remember that human "clams" are much like other clams in that they will "open-up" when exposed to heat,

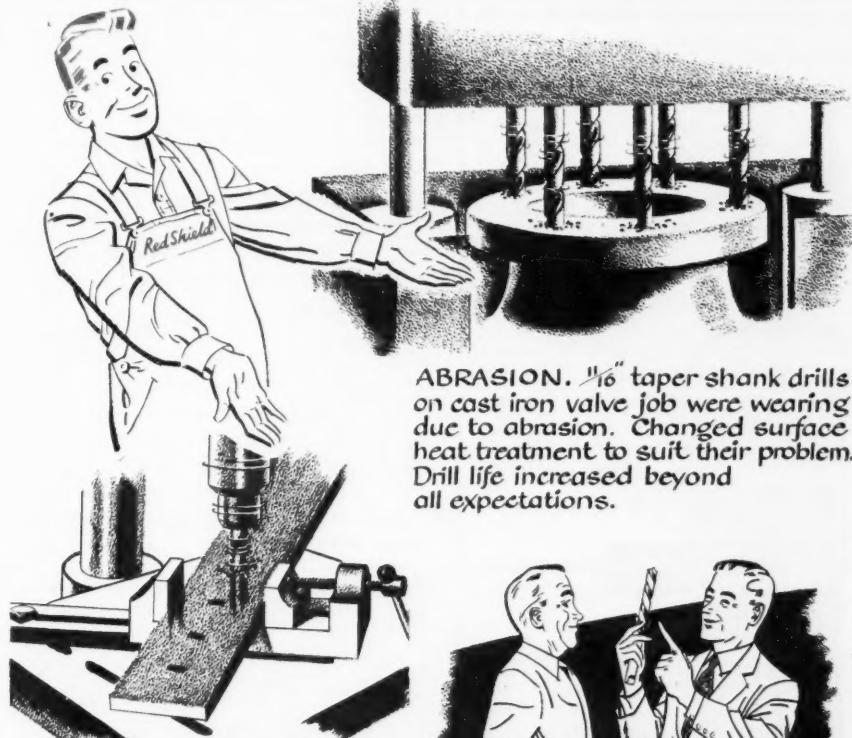
but it has to be the right temperature for the operation to be successful.

When talking to someone like this, don't be flustered at the quiet reception you get. Be calm and unhurried. Tell him that you really appreciate the close attention he pays to what you say. Then ask his opinion, invite his comment. Use careful questions which he or she cannot answer with a simple



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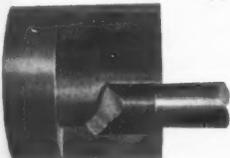
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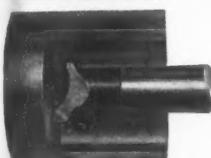
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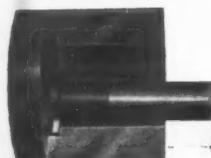
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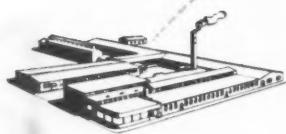
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33rd National Metal Congress and Exposition

DETROIT will be the 1951 host to the four participating societies who will cooperate in presenting the 33rd National Metal Congress and Exposition and First World Metallurgical Congress which is to be held in the city October 13 to 19, inclusive. The four societies are the American Society for Metals, American Welding Society, Metals Institute Division—American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive Testing.

The primary purpose of the Annual Metal Congress and Exposition is to bring together the experience, the knowledge and the means for a more effective use of metals through engineering and, through conservation and substitution, to insure an adequate supply of materials and material combinations for the strengthening of defense and the preservation of our security.

Exhibits

Approximately 350 Nationally known firms engaged in either the production of metals, the treatment of metals, their fabrication, or in rendering services to all of these will have exhibits. Nearly six and one half acres of floor space will be devoted to exhibits. In addition, thousands of square feet of floor space will be utilized for special meetings, forums, lectures and other activities.

Technical Programs

The four sponsoring societies, through their scheduled seminars, lecture sessions and meetings on technical subjects pertaining to metals production, treating and processing, will provide the National Congress, National Exposition and the World metallurgical Congress visitors with daily opportunity to hear vital technical subjects discussed and analyzed by some of the world's leading engineers and teachers. The American Society for Metals and the American Welding Society will hold morning, afternoon and evening sessions throughout the week of the Congress and Exposition. The Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers will hold daily and evening sessions Monday through Wednesday. The Society for Non-Destructive Testing will hold sessions during four days of the Congress Week.

World Metallurgical Congress

Metal resources, upon which rest the security and freedom of the world, will be thoroughly discussed by top-ranking metal scientists and engineers from the free nations of Europe, Africa and Asia, as well as from North and South America when they gather in Detroit to attend the World Metallurgical Congress, first international conclave of its kind. More than 500 "conferees" from upwards of 20 freedom loving countries will assemble for an "exchange of ideas" and join with thousands of American metallurgists who will participate in the Congress.

The foreign visitors, known as "conferees", will disembark in New York on September 13th and be welcomed at a Waldorf Astoria Hotel luncheon on September 17. They will visit essential industries along the Eastern seaboard en route to Washington where a meeting with President Truman on September 21 is anticipated. From there they will break into specialized groups for the tours across the nation.

According to the spokesmen for the Congress, special liaison representatives between the World Metallurgical Congress and various Government Departments have been appointed by Defense Mobilizer Charles E. Wilson, The E.C.A., State and Defense Departments and Charles Sawyer and Oscar L. Chapman, Secretaries of Commerce and Interior respectively.

The Tours comprise 15 to 30 conferees per team and are organized according to interest:

1. Steel making and refining—Among other visits, this group will view electrical, and acid refining processes in Pennsylvania, Ohio and Michigan, as well as some of the nation's largest steel making facilities.

2. Rolling and manufacturing of copper, aluminum, magnesium and their alloys—The tour includes an inspection of the manufacture of containers for highly active chemicals; and the refining back into basic metals huge stock-piles of scrap.

3. Metal fabrication; stamping, machining and finishing of alloys—Some 20 persons in this group will watch the making of everything from washing machine tubs to precision equipment used in highly technical robots manufactured by the International Business Machines Corporation, at Endicott, New York.

4. Heat treatment—This group will review various types of industrial furnace manufacture, forging, and heat treating process.

5. Welding and joining—The tour will visit plants manufacturing heavy tanks, diesel engines, freight car, refrigeration and automotive parts.

6. Inspection and testing—This group will review x-ray and supersonic testing devices.

7. A review of engineering and metallurgical education in the U. S.—Harvard, Yale, Princeton, Lehigh, Massachusetts Institute of Technology and Battelle Memorial Institute of Columbus, Ohio are only a few of the schools expected to be visited.

8. A research tour will visit Bell Telephone, U. S. Steel Corporation and Aluminum Company of America research foundation and laboratories among others.

Countries represented by conferees on the tours will be: Austria, Australia, Belgium, Brazil, Denmark, Finland, France, Germany, Greece, Holland, India, Italy, Japan, Luxembourg, Norway, New Zealand, Portugal, Sweden, Switzerland, Turkey and the United Kingdom.

The visitors will visit the biggest industrial establishments in the following American cities: CONNECTICUT, Ansonia, Hartford, Waterbury; ILLINOIS, Chicago, Elgin, McCook, Peoria, Rockford, Harvey, LaGrange, Urbana; INDIANA, Anderson, Gary, Hammond, Indianapolis, Muncie, Michigan City; KENTUCKY, Louisville; MARYLAND, Anacostia, Baltimore, Silver Springs; MASSACHUSETTS, Boston, Cambridge, Worcester; MICHIGAN, Ann Arbor, Detroit, Flint, Bay City, Pontiac, Port Huron, Plymouth, Saginaw; NEW JERSEY, Carteret, Kearny, Jersey City, Murray Hill, Camden, Phillipsburg; NEW YORK, Endicott, New York, Syracuse, Rome, Troy, Buffalo; OHIO Barberton Canton, Cincinnati, Cleveland, Columbus, Dayton, Middletown, Salem, Toledo; PENNSYLVANIA, Bellefonte, Bethlehem, Coatesville, Erie, Lebanon, New Kensington, Philadelphia, Pittsburgh, WEST VIRGINIA, Weirton; WISCONSIN, Milwaukee; and Washington, D. C..



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American Society for Metals Seminar on Metal Interfaces

Technical Sessions at the Hotel Statler

Saturday Morning, October 13

Theoretical Considerations

Atomistic Theory of Metallic Surfaces—By Conyers Herring, Bell Telephone Laboratories

Theory of Internal Boundaries—By Harvey Brooks, Cruft Laboratory, Harvard University

Grain Shapes and Other Metallurgical Applications of Topology—By Cyril Stanley Smith,
Director of Institute for the Study of Metals, University of Chicago

Saturday Afternoon, October 13

Interfacial Energies

Measurement of Solid: Liquid and Solid: Gas Interfacial Energies—By Harry Udin, Department
of Metallurgy, Massachusetts Institute of Technology

Measurement of Solid: Solid Interfacial Energies—By James B. Hess, Kaiser Aluminum and
Chemical Corporation, Spokane, Wash.

Energies and Structure of Grain Boundaries—By Karl T. Aust, Kaiser Aluminum and Chemical
Corp., and Bruce Chalmers, University of Toronto

Sunday Morning, October 14

Movements of Interfaces

Kinetics of Recrystallization—By David Harker, Director of Protein Structure Project, Brooklyn
Polytechnic Institute

Interfacial Movements During Recrystallization—By Paul A. Beck, Chairman, Department of
Metallurgy, University of Notre Dame

Interfacial Movements During Grain Growth—By Robert L. Fullman, Research Laboratory, Gen-
eral Electric Co.

Relative Interfacial Movements—By Arthur S. Nowick, Department of Metallurgy, Yale University

Sunday Afternoon, October 14

Effects of Interfaces

Phase Transformations at Interfaces—By Alfred H. Geisler, Research Lab., General Electric Co.

Mechanical Property Effects of Interfaces—By Bruce Chalmers, Dept. of Metallurgical Engineering,
University of Toronto

Phenomena at Surfaces—By Herbert H. Uhlig, Department of Metallurgy, Massachusetts Insti-
tute of Technology



Program of ASM Technical Papers

Technical Sessions at the Hotel Statler

Monday, October 15 — 9:30 A.M.

Constitution Diagrams

Constitution and Properties of Cobalt-Iron-Vanadium Alloys—By D. L. Martin and A. H. Geisler, General Electric Research Laboratories, Schenectady, N. Y.

Phase Relationships in the Iron-Chromium-Vanadium System—By Howard Martens, Research Engineer, and Pol Duwez, Associate Professor of Mechanical Engineering and Chief of Materials Section, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.

A Partial Titanium-Chromium Phase Diagram and the Crystal Structure of TiCr₂—By Pol Duwez, Associate Professor of Mechanical Engineering and Chief of Materials Section, and Jack L. Taylor, Research Engineer, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.

The Titanium-Silicon System—By M. Hansen, Supervisor, and H. D. Kessler and D. J. McPherson, Research Metallurgists, Nonferrous Metals Research, Armour Research Foundation, Chicago

The Indium-Antimony System—By T. S. Liu, Teaching Fellow, and E. A. Peretti, Professor of Metallurgy, University of Notre Dame, Notre Dame, Ind.

Monday, October 15 — 9:30 A.M.

Melting and Refining

A Proposed Steel Making Process—By A. Reggiore, Milan, Italy

A New Process for Direct Reduction of Iron Pyrites—By A. Scortecci, Genoa, Italy

A Rapid Analytical Method for Hydrogen in Steel—By Y. Ishihara and S. Sawa, Kamakura, Japan

Basic Bessemer Steel With Low Nitrogen and Phosphorus—By P. Coheur, Liege, Belgium

Phosphorus Deoxidation of Molten Copper—By W. A. Baker, Surry, England

Monday, October 15 — 2:00 P.M.

Diffusion

Interstitial Diffusion—By A. G. Guy, Associate Professor of Mechanical Engineering, University of North Carolina, Raleigh, N. C.

The Carbonitriding of Carbon and Alloy Steels—By H. C. Fiedler, M. B. Bever and C. F. Floe, Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

Chromium Diffusivity in Alpha Cobalt Chromium Solid Solutions—By John W. Weeton, Research Metallurgist, Lewis Flight Propulsion Laboratory, National Advisory Committee for Aeronautics, Cleveland

Anisothermal Diffusion of Carbon in Austenite—By J. E. Black, Captain, Ordnance Department, U. S. Army, Detroit Arsenal, Detroit, and G. E. Doan, Professor and Head, Department of Metallurgical Engineering, Lehigh University, Bethlehem, Pa.

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Program of AWS Technical Papers—Continued

Tuesday, October 16 — 9:30 A.M.

High Temperature Alloys

The Formation of Sigma Phase in 13 to 16% Chromium Steels—By H. S. Link and P. V. Marshall, U. S. Steel Co., Research & Development Laboratory, Pittsburgh

Electrolytic Etching—The Sigma Phase Steels—By John J. Gilman, Crucible Steel Company of America, Research Laboratory, Harrison, N. J.

Phase Changes Associated With Sigma Formation in 18-8-3-1 Chromium-Nickel-Molybdenum-Titanium Steel—By K. W. Bowen and T. P. Hoar, Cambridge, England

Composition Limits of Sigma Formation in Nickel-Chromium Steels at 1200° F. (650° C.)—By M. E. Nicholson, Assistant Professor, The Institute for the Study of Metals, University of Chicago, Chicago; C. H. Samans, Associate Director, Materials Division, Standard Oil Co. (Indiana), Chicago, and F. J. Shortsleeve, Research Assistant, Case Institute of Technology, Cleveland

Ferrite Formation Associated with Carbide Precipitation in 18-Cr - 8-Ni Austenitic Stainless Steel—By E. J. Dulis and G. V. Smith, Research Laboratory, U. S. Steel Co., Kearny, N. J.

Tuesday, October 16 — 9:30 A.M.

Mechanical Metallurgy

The Determination of Flow Stress From a Tensile Specimen—By E. R. Marshall, Instructor of Metallurgy, and M. C. Shaw, Associate Professor of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge.

Plastic Deformation of Zinc Bicrystals—By T. Kawada, Tokyo, Japan

The Mechanical Properties of Iron and Some Iron Alloys of High Purity—By W. P. Rees, Middlesex, England

Crystal Orientation in Cold-Rolled Silicon Steel Sheet—By I. Gokyu and H. Abe, Tokyo, Japan

Delayed Yield in Annealed Steels of Very Low Carbon and Nitrogen Content—By D. S. Wood, Assistant Professor, and D. S. Clark, Associate Professor, Department of Mechanical Engineering, California Institute of Technology, Pasadena, Calif.

Tuesday, October 16 — 2:00 P.M.

High Temperature Alloys

Cast Heat Resistant Alloys of the 21% Chromium—9% Nickel Type—By Howard S. Avery, Research Metallurgist; Charles R. Wilks, Metallurgist, and John A. Fellows, Research Metallurgist, American Brake Shoe Co., Mahwah, N. J.

Influence of Extended Time on Creep and Rupture Strength of 16-25-6 Alloy—By C. L. Clark and M. Fleischmann, Metallurgical Engineers, Steel & Tube Division, Timken Roller Bearing Co., Canton, and J. W. Freeman, Research Engineer, Engineering Research Institute, University of Michigan, Ann Arbor, Mich.

Isothermal Transformation, Hardening and Tempering of 12% Chromium Steel—By R. L. Rickett, Research Laboratory, U. S. Steel Co., Kearny, N. J.; W. F. White, U. S. Steel Co., Pittsburgh; C. S. Walton, U. S. Steel Co., Pittsburgh, and J. C. Butler, South Works, U. S. Steel Co., S. Chicago, Ill.

Cladding of Molybdenum for Service in Air at Elevated Temperature—By W. L. Bruckart, Research Engineer, and R. I. Jaffee, Supervisor in Nonferrous Physical Metallurgy, Battelle Memorial Institute, Columbus, Ohio

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Program of ASM Technical Papers—Continued

Wednesday, October 17 — 9:30 A.M.

ASM ANNUAL MEETING

Edward DeMille Campbell Memorial Lecture

Wednesday, October 17 — 2.00 P.M.

Embrittlement

Effects of Decomposition of Retained Austenite During Tempering on Notch Toughness and Tensile Properties—By E. F. Bailey and W. J. Harris, Jr., Members of Ferrous Alloys Branch, Naval Research Laboratory, Washington, D. C.

Comparison of the Effects of Alloying Elements on the Lower and Upper Transition Temperatures in Pearlitic Steel—By J. A. Rinebolt and W. J. Harris, Jr., Ferrous Alloys Branch, Naval Research Laboratory, Washington, D. C.

Effect of Retained Austenite Upon Mechanical Properties—By L. S. Castleman, Atomic Power Division, Westinghouse Electric Corp., Pittsburgh; B. L. Averbach, Assistant Professor of Physical Metallurgy, and Morris Cohen, Professor of Physical Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

Some X-Ray Diffraction and Electron-Microscope Observations on Temper-Brittle Steels—By S. R. Maloof, Research Metallurgist, Springfield Armory, Springfield, Mass.

Thursday, October 18 — 9:30 A.M.

Mechanical Metallurgy

Strain Aging Effects—By J. D. Lubahn, Metallurgy and Ceramics Divisions, General Electric Co., Research Laboratory, Schenectady, N. Y.

Fatigue Strength of Large, Notched Steel Bars Surface Hardened by Gas Heating and by Induction Heating—By S. L. Case, J. M. Berry and H. J. Grover, Battelle Memorial Institute, Columbus, Ohio

Deep Drawing Limits for Rectangular Boxes—By T. Ishikawa, Osaka, Japan

Elimination of Yield Point Phenomena by Temper Rolling and Roller Leveling—By N. H. Polakowski, Swansea, England

Effect of High Heating Rate on the Tensile Properties of Metals—By W. K. Smith, Metallurgist, C. C. Woolsey, Metallurgist, and W. O. Wetmore, Head, Metallurgy Branch, U. S. Naval Ordnance Test Station, China Lake, Calif.

Thursday, October 18 — 9:30 A.M.

High Temperature Phases

An Interpretation of the Hysteresis Loops in A_3 and A_1 Transformations of Pure Iron—By K. Honda and M. Sato, Tokyo, Japan

Magnetic Property Changes in Iron Molybdenum Alloys During Aging—By T. Mishima, R. Hasizumi and Y. Kamura, Tokyo, Japan

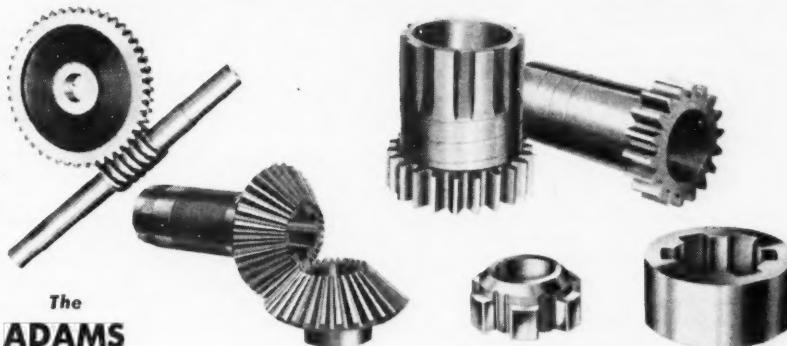
Age Hardening—By T. Mishima, Tokyo, Japan

Carbide Reactions in High Temperature Alloys—By J. R. Lane, Naval Research Laboratory, Washington, D. C., and N. J. Grant, Associate Professor of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

The Allotropy of Cobalt—By A. G. Metcalfe, Delford, Ontario, Canada

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Program of ASM Technical Papers—Continued

Thursday, October 18 — 2:00 P.M.

Heat Treatment

Stress-Induced Transformation of Retained Austenite in Hardened Steel—By B. L. Averbach, S. G. Lorris and Morris Cohen, Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

An Investigation of the Quenching Characteristics of a Salt Bath—By M. J. Sinnott, Associate Professor of Chemical and Metallurgical Engineering, and J. C. Shyne, Graduate Student, Department of Metallurgical Engineering, University of Michigan, Ann Arbor, Mich.

Limitations of the End Quench Hardenability Test—By A. R. Troiano, Professor of Physical Metallurgy, and L. J. Klingler, Senior Research Associate, Case Institute of Technology, Cleveland

A Correlation of End-Quenched Test Bars and Rounds in Terms of Hardness and Cooling Characteristics—By E. W. Weinman, Research Metallurgist; R. W. Thompson, Assistant Head, and A. L. Boegehold, Head, Department of Metallurgy, General Motors Corporation, Research Laboratories Div., Detroit.

Friday, October 19 — 9:30 A.M.

Physical Metallurgy

Particle Size Analysis of Metal Powders—By C. C. Gregg and Bernard Kopelman, Sylvania Electric Products, Inc., Bayside, N. Y.

Interrelation of Mechanical Properties, Casting Size, and Microstructure of Ductile Cast Iron—By R. W. Kraft and R. A. Flinn, Metallurgy Department, American Brake Shoe Co., Mahwah, N. J.

Gas Evolution from Gray Cast Iron During Enameling—By L. F. Porter, Research Metallurgist, and P. C. Rosenthal, Professor of Metallurgy, Department of Mining and Metallurgy, University of Wisconsin, Madison, Wis.

Aluminum—6 Per Cent Magnesium Wrought Alloys for Elevated-Temperature Service—By K. Grube, Research Engineer, and L. W. Eastwood, Supervisor, Nonferrous Metallurgy, Battelle Memorial Institute, Columbus, Ohio

A Study of the Microhardness of the Major Carbides in Some High Speed Steels—By P. Leckie-Ewing, Metallurgist, Union Twist Drill Co., Butterfield Division, Rock Island, Que., Canada.

ASM Educational Lectures

Residual Stress Measurements

Monday, October 15 — 8-10 P.M.

Origin, Nature and Effects of Residual Stresses—By R. G. Treuting, Bell Telephone Laboratories, Murray Hill, N. J.

Measurements of Residual Stresses—By J. J. Lynch, Case Institute of Technology, Cleveland, Ohio

Tuesday, October 16 — 8-10 P.M.

Residual Stress States Produced in Metals by Various Processes—By H. B. Wishart, U. S. Steel Company, Gary, Ind.

Relief and Re-Distribution of Residual Stresses in Metals—By D. G. Richards, United Aircraft Corporation, E. Hartford, Conn.

Principles of Heat Treatment

Three one-hour periods devoted to "Principles of Heat Treatment"—By M. A. Grossmann, U. S. Steel Company, Pittsburgh, Pa.

Tuesday, October 16 — 4:30 P.M.

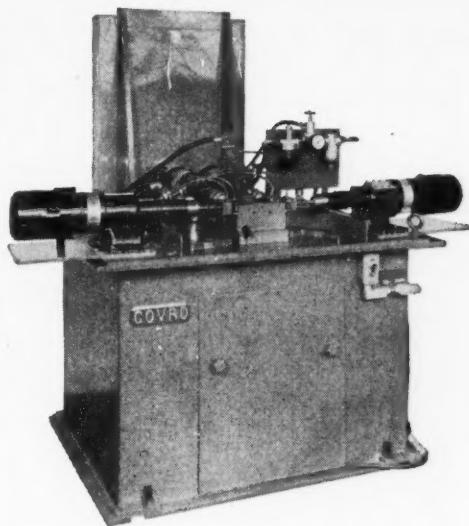
1. Hardening. 2. Hardenability and Quenching.

Wednesday, October 17 — 4:30 P.M.

3. Isothermal Diagrams and Martensite. 4. Tempering.

Wednesday, October 17, 8 P.M.

5. Grain Size. 6. Hardness, Strength and Toughness.



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1951 ASM Award Winners

PRESENTATION of three top awards will be a feature of the annual dinner of the American Society for Metals, Thursday, October 18th, which will be held in the Grand Ballroom of the Hotel Statler in Detroit, Michigan.

The Albert Sauveur Achievement Award

The Sauveur Achievement Award, established by the American Society for Metals in 1934, will be presented in 1951 to Dr. Robert F. Mehl, Head Department of Metallurgy, Carnegie Institute of Technology, Pittsburgh, Pennsylvania. The purpose of the Award is to recognize pioneering metallurgical achievements which have stimulated organized work along similar lines to such an extent that a marked basic advance has been made in metallurgical knowledge. Dr. Mehl is the fifteenth to receive the Award since it was first established and presented to Dr. Albert Sauveur, late Harvard Professor, and widely known as the "Dean of American Metallurgists."

Dr. Mehl is one of the country's noted authorities on general metallurgy and has contributed much to the development of special phases of the science, particularly in the field of "Constitution of Alloys," "Crystal Structure," "Diffusion" and "Age Hardening."

The 1951 Sauveur Award winner is a graduate of Franklin and Marshall College, with a Ph.D. from Princeton University.

Gold Metal—American Society for Metals

Dr. Paul D. Merica, Executive Vice President, International Nickel Company, New York, is the 1951 recipient of the American Society for Metals' Gold Medal.

The ASM Gold Medal was established in 1943 to recognize outstanding metallurgical knowledge and exceptional ability in the diagnosis and solution of diversified metallurgical problems.

Dr. Merica is one of the country's top authorities in the development of light metals. It was in this field that Dr. Merica made vital contributions while a member of the staff of the National Bureau of Standards. His chief concern with the Bureau was the development of light alloys for airplane construction.

The 1951 Gold Medalist is a native of Indiana and received his engineering education at DePauw University and the University of Wisconsin. He holds a Doctorate in Physics from the University of Berlin. He joined International Nickel shortly after the first world war, and has been a Vice President since 1936.

Medal for the Advancement of Research—American Society for Metals

The 1951 ASM Medal for the Advancement of Research will go to Gwilym A. Price, President, Westinghouse Electric Corporation.

Founded in 1943 by the American Society for Metals, the Research Medal is based on these qualifications which Mr. Price fulfills to a high degree: "The candidate shall be an executive in an industrial organization, the principal activity of which is the production and fabrication of metals. He shall be one who, over a period of years, has consistently sponsored metallurgical research or development, and, by his foresight and influence in making available financial support, has helped substantially to advance the arts and sciences related to metals."

Mr. Price has been an executive with Westinghouse since 1943, and president of the Corporation since 1946. His company, in 1950, made available a total of \$50,000,000 in support of programs of research and engineering.

The 1951 Research Medalist is of Welsh ancestry, and is a graduate of the University of Pittsburgh Law School.



Dr. Robert F. Mehl



Dr. Paul D. Merica



Gwilym A. Price



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Program of AWS Technical Papers

Technical Sessions at the Book-Cadillac Hotel

Monday Morning, October 15

Two Simultaneous Sessions

Structural Welding

Yield Strength of Welded Continuous Beams—By C. H. Yang and L. S. Beedle, Lehigh University, Fritz Engineering Laboratory, and H. G. Johnston, University of Michigan
Column Strength Under Combined Bending and Thrust—By R. L. Ketter and L. S. Beedle, Lehigh University, Fritz Engineering Laboratory, and B. G. Johnston, University of Michigan
Estimating Weldments and Welded Structural Steel—By Chas. F. Frantz, Lehigh Structural Steel Co.
Surface Conditioning of Structural Steel by Welding—By R. E. Somers and H. C. VonBlohn, Bethlehem Steel Co.

Resistance Welding

Physical and Metallurgical Characteristics of Spot Welding Titanium—By M. L. Begeman, J. C. Fontana and Frank W. McBee, Jr., The University of Texas
The Application of Spot and Seam-Welding to Design—By S. P. Jenkins and Thomas E. Piper, Northrop Aircraft, Inc.
Spot and Projection Welding Using Magnetic Electrode Force—By William E. Klingeman and H. H. Krueer, Precision Welder and Machine Co.
A Case of Power—By Myron Zucker, Myron Zucker Engineering Co., Jerry Gerald, Midwest Wire Products Co., and Paul Duker, The Detroit Edison Co.

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Program of ASM Technical Papers—Continued

Monday Afternoon, October 15

Three Simultaneous Sessions

Resistance Welding

Seam Welding Containers Automatically—By C. S. Seltzer, Swift Electric Welder Co.
Spot and Seam Welding of Nimonic and Similar Heat-Resistant Alloys—By J. Solomon, Sciaky Bros., Inc.

Weldability

Microcracks and the Low-Temperature Cooling Rate Embrittlement of Arc Welds in Mild Steel—
By Prof. A. E. Flanigan, Department of Engineering, University of California
Effect of Sub-Critical Cooling Rate on Strain and Quench Aging of Structural Steels—By C. Felmley, C. Hartbower and W. S. Pellini, Metallurgy Division, Naval Research Lab.

NonFerrous

Tensile Tests and Metallurgical Studies of Welded Copper Joints—By R. J. Mosborg, R. W. Bohl,
F. L. Howland and W. H. Munse, Department of Civil Engineering, University of Illinois
Welding Iron-Bearing Alpha Aluminum Bronze—By F. Emergy Garriott, Weldrod Department,
Ampco Metal, Inc.
Pressure Welding Aluminum at Various Temperatures—By M. A. Miller and G. W. Oyler, Aluminum Research Laboratories

Monday Evening, October 15

President's Reception

Tuesday Morning, October 16

Two Simultaneous Sessions

Ship Structure

Work of the Ship Structure Committee—By Rear Admiral K. K. Cowart, U. S. Coast Guard
Low-Carbon Steel: Subcritical Heating vs. Transition Temperatures—By L. J. Klinger, E. B. Evanskes and Wm. M. Baldwin, Case Institute of Technology
Studies of Tests for Evaluating Welded Ship Steels—By C. B. Voldrich and P. J. Rieppel, Battelle Memorial Institute.
Stress Studies of Bulkhead Intersections for Welded Tankers—By W. R. Campbell and L. K. Irwin, National Bureau of Standards.
The Influence of Composition and Steel-Making Practice Upon Ship-Plate Quality—By H. M. Banta, Battelle Memorial Institute

Fundamental Studies of Arc Welding

The Effect of Power Supply Characteristics on D.C. Welding—By Jack B. Keyte, Department of Welding Engineering, Ohio State University
Welding Characteristics of Submerged Arc with Three-Phase Power—By E. A. Clapp, Union Carbide and Carbon Research Laboratories, Inc., and Norman G. Schreiner, Linde Air Products Co.
Tools for Predetermining Preheat and Interpass Temperatures for Submerged Arc Welds—By Clarence E. Jackson and Arthur F. Shrubsall, Union Carbide and Carbon Research Laboratories, Inc.

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Program of AWS Technical Papers—Continued

Tuesday Morning, October 16

Inspection Trip

Arrangements have been made for an Inspection Trip to the plants of the Ford Motor Co.

Tuesday Afternoon, October 16

Three Simultaneous Sessions Ship Structure

Welded Reinforcement of Openings in Structural Steel Plates—By D. Vasarhelyi and R. A. Hechtman, University of Washington

Evaluation of Welding Procedure by Direct Explosion Testing—By G. S. Mikhlapov, Metallurgical Research and Development Co.

Investigation of Factors Which Determine Welded Performance—By C. Hartbower and W. S. Pellini, Naval Research Laboratory

Upper and Lower Transition in Charpy Tests—By W. J. Harris, Jr., J. A. Rinebolt and R. Haring, Naval Research Laboratory

Hard Facing and Flame Hardening

Control of Rail-End Hardening—By La Motte Grover, Air Reduction Sales Co.

Hard Facing for Impact—By Howard S. Avery, American Brake Shoe Co.

Development of Fused Metallized Coatings—By Harrison S. Sayre, U. S. Naval Engineering Experiment Station

Resistance Welding

Trends in Electronic Nonsynchronous Resistance Welding Controls—By Stuart C. Rockafellow, Robatron Corp.

Flash Welding of Components for Aircraft and Similar Applications—By J. H. Cooper, The Taylor-Winfield Corp.

Fatigue Strength of Spot-Welded Light Alloy Joints—By H. Kihara, President, The Japan Welding Society

Tuesday Evening, October 16

Adams Lecture

Wednesday Morning, October 17

Three Simultaneous Sessions Production Welding

Welding Heat Exchanger for the Chemical Industry—By John W. Mortimer, Professional Engineer

Product Design for Welding—By John Mikulak, Worthington Pump and Machinery Corp.

Welding Fixtures for Use with Submerged Arc—By J. P. Berkeley, Berkeley Equipment Co.

Pressure Vessels

Effect of Fabrication Processes on Steel Used in Pressure Vessels—By Dr. S. S. Tor, J. M. Ruzek, Dr. R. Stout, Lehigh University, Fritz Engineering Laboratory

Biaxial Fatigue Tests on Flat Plate Specimens—By R. U. Blaser, L. F. Kooistra and J. T. Tucker, Jr., The Babcock & Wilcox Co.

Stresses in Large Horizontal Cylindrical Pressure Vessels on Two Saddle Supports—By Leonard P. Zick, Chicago Bridge and Iron Co.

Gas Cutting

Oxygen Cutting of Defense Equipment Materials—By A. H. Yoch, Air Reduction Sales Co.

Heavy Scrap Cutting—By L. P. Elly, Bethlehem Steel Co.

Powder-Washing for Metal Removal—By R. S. Babcock, Linde Air Products Co.

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Program of AWS Technical Papers—Continued

Wednesday Afternoon, October 17

Three Simultaneous Sessions *Weldability*

- The Relation of Notch Strains to Bend Angles in the Notched-Bend Test—By Prof. A. E. Flanigan, University of California, and Ernest M. Emery, North American Aviation Co.
Repeated Load Tests on Welded and Prestrained Steel—By Dr. S. S. Tor, J. M. Ruzek, Dr. R. D. Stout, Lehigh University, Fritz Engineering Laboratory
The Micro-Mechanism of Fracture in the Tension-impact Test—By W. H. Bruckner, University of Illinois

Welding and Brazing

- Nested Electrodes for Metal Arc Welding—By W. A. Snyder, University of Washington
Welding in Steel Mill Maintenance During Defense Period—By R. L. Deily, Air Reduction Sales Co.
Dilution and Diffusion Aspects of Brazing—By R. D. Wasserman and Joseph F. Quaas, Eutectic Welding Alloys Corp.

Stainless Steels

- Welding of High-Alloy Steel Castings—By R. D. Thomas, Jr., Chairman of WRC Committee on the subject
The Structural Stability of Welded Joints Between Dissimilar Metals in High-Temperature Service—By R. W. Emerson, Pittsburgh Piping & Equipment Co.

Thursday Morning, October 18

Three Simultaneous Sessions *Educational*

- Selecting and Training Welding Operators for the Defense Program—By A. N. Kugler, Air Reduction Sales Co.
Metallurgy for the Welding Student—By J. D. Paterson, Cass Technical High School
Tentative Standards for School Welding Shops—By Carl H. Turnquist, Cass Technical High School
Welding Instruction in the Public Schools—By A. D. Althouse, Detroit Public Schools

Weldability

- The Arc Welding of Carbon-Molybdenum Steel Pipes—By F. J. Winsor, E. I. du Pont de Nemours and Co.
Residual Stresses Due to Circumferential Welds in Seamless Mild Steel Pipe—By L. J. Privoznik, Standard Oil Co. (Ind.)
Heat Treating Properties of Low-Hydrogen Electrode Weld Metal—By D. C. Smith and W. G. Rinehart, Harnischfeger Corp.
High-Temperature Welded Joints—By R. H. English, National Alloy Steel Co.

Inert-Arc Welding

- Inert Gas Shielded Metal Arc Welding of Magnesium—By Paul Klain, Dow Chemical Co.
Aircomatic Welding of Ferrous Metals—By E. Dilberti, Air Reduction Co.
Metal Transfer in Shielded Inert Gas Metal Arc Welding—By R. T. Breymeier, Union Carbide and Carbon Research Laboratory
High-Speed Consumable Electrode Machine Welding for Aircraft—By Bernard Gross and R. A. Smith, Rohr Aircraft Corporation



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Program of AWS Technical Papers—Continued

Thursday Afternoon, October 18 Symposium

Filler Metal Specifications for Inert-Gas and Submerged-Arc Welding

BUSINESS MEETING

BOARD OF DIRECTORS' MEETING

Thursday Evening, October 18 ANNUAL DINNER

Presentation of Awards

Friday Morning, October 17

Two Simultaneous Sessions

Inert-Arc Welding

Aircomatic Welding-Refinery Components and Pressure Vessels—By S. Yaczko, United Engineers & Constructors, Inc.

Shielded Inert Gas Metal Arc Welding—By H. T. Herbst, Linde Air Products Co.

Performance of High-Strength Aluminum Alloy Weldments—By W. R. Apblett and W. S. Pellini, Metallurgy Division, Naval Research Laboratory

Thoriated Tungsten Electrodes—Their Welding, Characteristics and Applications—By G. J. Gibson and R. O. Seitz, Air Reduction Sales Co.

Metallizing

Fundamentals of the Metallizing Process—By F. J. Keller, Aluminum Research Laboratories

New Developments on Metallizing During the Past Ten Years—By Sam Tour, Sam Tour and Co.

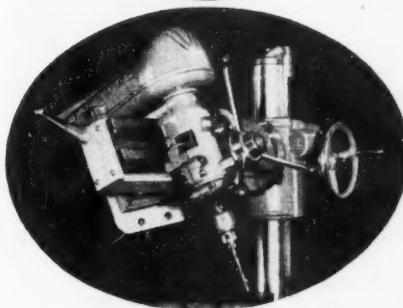
Typical Applications of Metallizing—By K. B. Smith, Dix Engineering Co.

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**Technical Papers
AIME Metals Branch**

Technical Sessions at the Detroit-Leland Hotel

Monday, October 15—9 A.M. - 12 M.

Grain Growth and Recrystallization

Grain Structure of Aluminum Killed Low Carbon Steel—By R. L. Solterland, C. W. Beattie, Armco Steel Corporation

Theory of Grain Boundary Migration Rates—By D. Turnbull, General Electric Co.

Secondary Recrystallization in Copper Wire—G. Bassi, A. B. Svenska, Metallverken, Sweden
Cleavage and Polygonization of Molybdenum Single Crystals—By N. K. Chen and R. Maddin, Johns Hopkins University

Monday, October 15—9 A.M. - 12 M.

Alloy Systems—I

Systems Titanium-Molybdenum and Titanium-Columbium—By M. Hansen, H. D. Kessler and D. J. McPherson, Armour Research Foundation, and E. L. Kamen, U. S. Naval Reserve

Ti_{50}Si_{30}, $Ti_{50}Ge_{30}$, 和 $Ti_{50}Sn_{30}$ —By P. Pietrokowski and Pol Duwez, California Institute of Technology

Solidification of Lead-Tin Alloy Droplets—By J. H. Hollomon and D. Turnbull, General Electric Company

Equilibrium Relations in Magnesium-Aluminum-Manganese Alloys—By R. J. Nelson, Aluminum Company of America

Constitution and Precipitation Hardening Properties of Copper-Rich Copper-Tin Beryllium Alloys
By R. A. Cresswell and J. W. Cuthbertson, Tin Research Institute (England)



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Program of AIME Institute of Metals Branch Papers—Continued

Monday, October 15—2 - 5 P.M.

Seminar — Dislocations in Metals

Nature of Dislocations—By Frederick Seitz, University of Illinois

Role of Dislocations in Crystal-Growth and Grain-Boundary Phenomena—By W. T. Read, Bell Telephone Laboratories

Monday, October 15 — 8 - 10 A.M.

Seminar — Dislocation of Metals

Theories of Dislocations as Applied to Mechanical Behavior—By Egon Orowan, Massachusetts Institute of Technology

Tuesday, October 16 — 9 A. M. - 12 M.

Transformations

Rapid Tempering of High Speed Steel—By A. E. Powers, General Electric Co., and J. F. Libach, Lehigh University

Effect of Rate of Cooling on the Alpha-Beta Transformation in Titanium and Titanium-Molybdenum Alloys—By Pol Duwez, California Institute of Technology

Burst Phenomenon in the Martensitic Transformation—By E. S. Machlin and Morris Cohen, Massachusetts Institute of Technology

Isothermal Formation of Martensite at Sub-zero Temperatures in a High Chromium Steel—By C. S. Das Gupta, University of Notre Dame, and B. S. Lement, Massachusetts Institute of Technology

Isothermal Transformation and Properties of a Commercial Aluminum Bronze—By A. H. Kasberg, Jr., Westinghouse Electric Corp., and D. J. Mack, University of Wisconsin

Tuesday, October 16 — 9 A.M. - 12 M.

Alloy Systems — II

Crystal Structure of UAL—By B. S. Borie, Jr., Oak Ridge National Laboratories

Intermediate Phases in Ternary Alloy Systems of Transition Elements—By P. A. Beck, University of Notre Dame; Sheldon Rideout and W. D. Manly, Oak Ridge National Laboratories; E. L. Kamen, U. S. Naval Reserve, and B. S. Lament, Massachusetts Institute of Technology

Intermetallic Compounds in the System Molybdenum-Beryllium—By S. G. Gordon and G. E. Klein, Los Alamos Scientific Laboratory; J. A. McGury and W. J. Koschuba, NEPA Project

Chromium-Nickel Phase Diagram—By S. Bloom and N. J. Grant, Massachusetts Institute of Technology

Effect of Tungsten or Molybdenum Upon the Alpha-Beta Transformation and Gamma Precipitation in Cobalt-Chromium Alloys—By A. R. Elsea and E. E. Fletcher, Battelle Memorial Institute

Tuesday, October 16 — 2 - 5 P.M.

Light Metals

Effects of Pre-Compression on the Behavior of the Aluminum Alloy 24ST, During Cyclic Direct Stressing—By S. I. Liu, Pei-Yank University

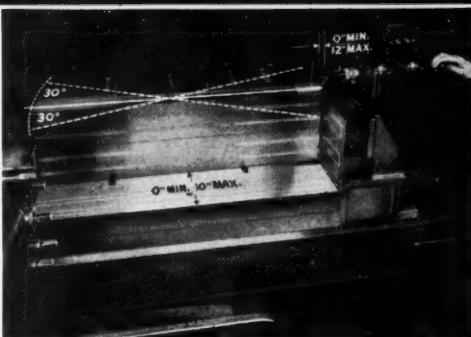
Structure Studies of Plastic Deformation in Aluminum Single Crystals—By N. K. Chen, Johns Hopkins University, and C. H. Mathewson, Yale University

Effect of Alloying Elements on the Elevated Temperature Plastic Properties of Alpha Solids Solutions of Aluminum—By J. E. Dorn, O. D. Sherby, and R. A. Anderson, University of California

Effect of Alloying Elements on the Electrical Resistivity of Aluminum Alloys—By A. T. Robinson and J. E. Dorn, University of California

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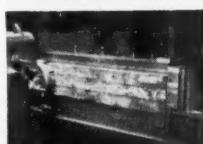
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Creep

- Fundamental Effects of Cold Working on the Creep Resistance of an Austenitic Alloy—By D. N. Frey and J. W. Freeman, University of Michigan
Creep Characteristics of Some Platinum Metals at 1382° F.—By Ralph H. Atkinson, D. R. Furman, International Nickel Company
Creep Behavior of Zinc as Modified by Copper in the Surface Layer—By Earl R. Parker and M. R. Pickus, University of California
Creep and Stress Rupture Behavior of Aluminum as a Function of Purity—By Italo S. Servi and N. J. Grant, Massachusetts Institute of Technology

Tuesday, October 15 — 7 P.M.

INSTITUTE OF METALS DIVISION FALL DINNER

Wednesday, October 17 — 2 - 5 P.M.

High Temperature Oxidation of Metals and Alloys

- Oxidation of Titanium—By M. H. Davies and C. E. Birchenall, Carnegie Institute of Technology
Thermal Stability of the Chromium, Iron and Tungsten Borides in Steaming Ammonia and the Existence of a New Tungsten Nitride—By Roland Kiessling and Y. H. Liu, University of Uppsala, Sweden
High Temperature Oxidation of Copper-Palladium and Copper-Platinum Alloys—By D. E. Thomas, Westinghouse Electric Corp.
Mechanism and Kinetics of the Scaling of Iron—By M. H. Davies, M. Y. Simnad, and C. E. Birchenall, Carnegie Institute of Technology
Thermal Variation of Young's Modulus in Some Fe-Ni-Mo Alloys—By Morris E. Fine and W. C. Ellis, Bell Telephone Laboratories

Wednesday, October 17 — 2:30 - 5 P.M.

Powder Metallurgy

- Role of Gases in the Production of High Density Powder Compacts—By Donald Warren and J. F. Libsch, Lehigh University
Solubility Relationships in Some of the Ternary Systems of Refractory Mono-Carbides—By John T. Norton, Massachusetts Institute of Technology, and A. L. Mowry, Kaiser Aluminum and Chemical Company

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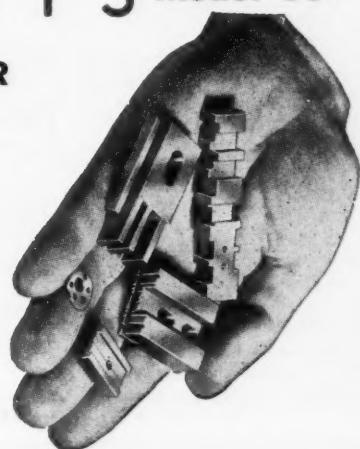
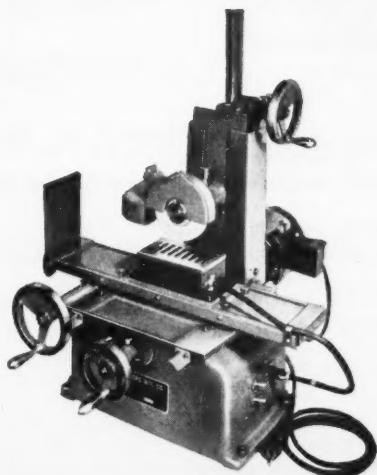
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Ultrasonic Methods of Testing Various Engineering Materials (Including recent developments in equipment and technique.)

Monday Afternoon Session

Testing of Porcelain Enamels and Ceramics with Statiflux

Stress Analysis by Magnetic Means

Sensitivity Limits in Fluoroscopy

Radiographic Porosity Standards vs. Tensile Properties of Light Alloy Castings

Tuesday Morning Session

Magnetic Particle Inspection Methods (Including recent developments in photoelectric and magnetic scanning of indications.)

Tuesday Afternoon Session

Radiographic Inspection (Including data on the latest developments in "TV" and "Crystal" pick up and presentation of X-Ray images.)

Wednesday Morning Session Symposium

Testing of Jet Engine Parts

Wednesday Afternoon Session Symposium

Testing of Ordnance Material

Thursday Morning Session

Statistical Quality Control Employing Non-Destructive Testing Methods

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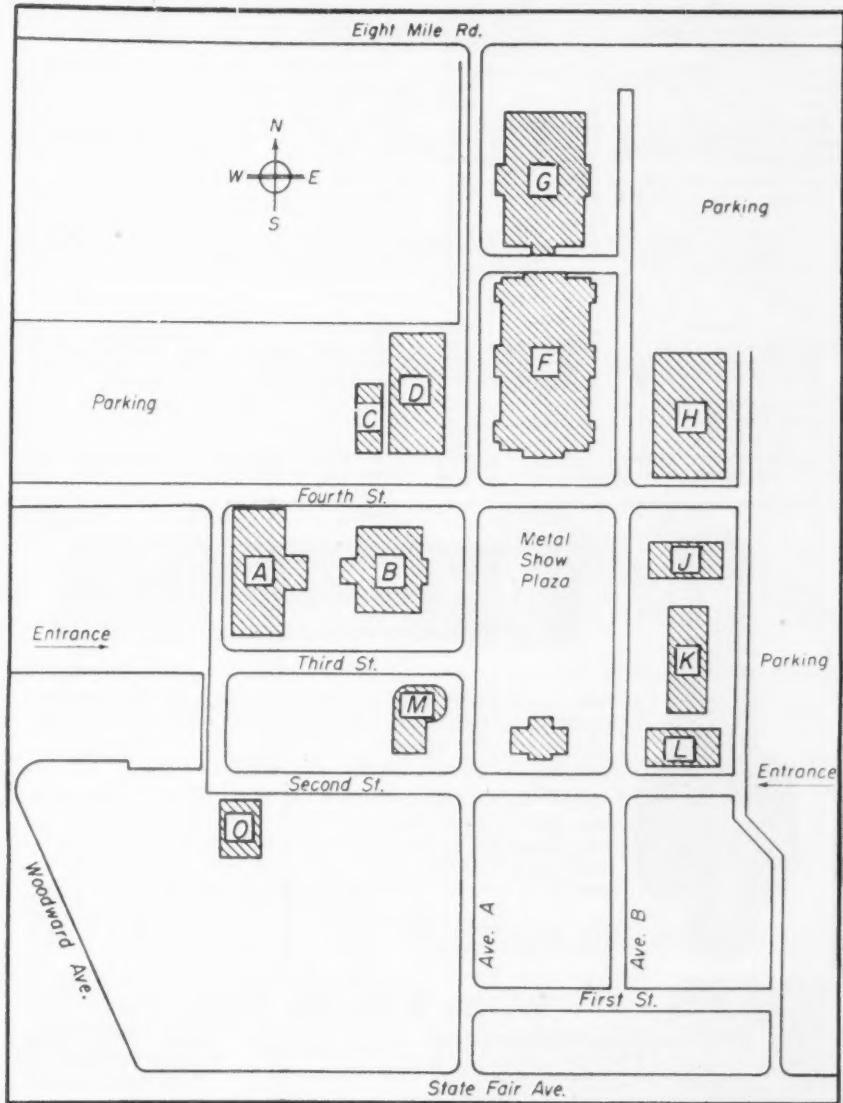
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A. B. C. Die Casting Machine Co.	G127	Baird Associates, Inc.	H427
Ocetogen Gas Co.	A215	Bakelite Division,	
Acme Manufacturing Co., Inc.	D103	Union Carbide & Carbon Corp.	F322
Acme Steel Company	C221	Baker & Co., Inc.	A363
Acme Tool Company	A205	Baldwin-Lima-Hamilton Corp.	D311
Adamas Carbide Company	H218	Banner Manufacturing Co.	H302
Air-Flow Compressor Co.	H219	Bausch & Lomb Optical Co.	B102
Ajax Electric Company, Inc.	F421	Bell & Gossett Company	A308
Ajax Electrothermic Corp.	F421	Bernard Welding Equipment Co.	H220
Ajax Engineering Corp.	F421	Blakeslee & Co., G. S.	A250
Ajusto Equipment Co.	H147	Boice-Crane Co.	A141
Aktiebolaget Kanthal	G352	Bowser, Inc.	H416
Allegheny Ludlum Steel Corp.	G459	Brainard Steel Company	G151
Allied Products Corp.	F302	Brown-Hutchinson Iron Works	A149
Allison Company	H431	Bruce Products Corporation	H223
Alloy Engineering & Casting Co., Inc.	B107	Bruning Company, Inc., Charles.	F426
Alex Corporation	C112	Brush Development Company	B147
Alvey-Ferguson Co.	H502	Buck Tool Co.	C224
American Brakelock Div.		Buehler, Limited	B131
American Brake Shoe Company	F339	Bundy Tubing Company	D202
American Chain & Cable Co., Inc.	A342	C	
American Cyanamid Company	G452	Cadillac Stamp Co.	H258
American Gas Association	G160	Cam-Lok Division,	
American Gas Furnace Co.	G154	Empire Products, Inc.	H520
American Machine & Metals, Inc.	B246	Cambridge Wire Cloth Co.	C111
American Machinist (publ.)	G256	Campbell Machine Division,	
American Manganese Steel Div.	F339	American Chain & Cable Co.	A342
American Metal Market	C110	Carboloy Department,	
American Metals Co., Ltd.	G459	General Electric Company	F214
American Optical Company	B128	Casting Engineers, Inc.	H324
American Platinum Works	G240	Chicago Metal Hose Corp.	C218
American Pullmax Co., Inc.	A249	Chicago Rivet & Machine Co.	G214
American Silver Company, Inc.	D129	Chicago Tramrail Corporation	H215
American Society for Metals		Chilton Co., Inc.	A256 and A138
(Detroit Chapter)	H420	Chrysler Corporation	G416
American Society for Metals		Cincinnati Milling Machine Co.	G356
(National Office)	H323	Cities Service Oil Company	D210
American Society of Tool Engineers	H245	Clark Instrument Co.	B143
American Wheelabrator & Equip. Corp.	F439	Climax Molybdenum Company	D250
Ames Precision Machine Works	A152	Clinton Machine Co., Warner Division	H546
Amplex Manufacturing Co.	G416	Coast Metals, Inc.	H426
Anchor Drawn Steel Co.	D345	Coles Cranes, Inc.	F307
Anderson Bros. Mfg. Co.	H351	Colonial Steel Division,	
Anderson Oil Co., F. E.	F255	Vanadium Alloys Steel Co.	D345
Angier Corporation	G139	Commander Manufacturing Co.	A159
Applied Research Laboratories	G121	Commercial Shearing & Stamping Co.	D321
Arcos Corporation	F457	Commercial Steel Treating Company	D310
Aronson Machine Co.	C127	Composite Die Supply Company	D112
Ashdee Products, Inc.	G361	Congress International des	
Ashworth Bros., Inc.	D140	Fabrications Mecaniques	H519
Atlas Press Co.	A241	Connors & Davis Sales Corp.	H423
Aurora Metal Company	C215	Continental Industrial Engineers, Inc.	H345
Austenal Laboratories, Inc.	B142	Continuous Metalcast Corp.	G459
Automotive Industries	A256	Crane Packing Company	D242
Avon Tube Division	C237	Cro-plate Co., Inc.	G122
		Crucible Steel Co. of America....	G310

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LIST OF EXHIBITORS Continued

Company	Booth	Company	Booth
D			
Dake Engine Company	F416	Eldorado Mining and Refining Ltd.	H118
Deepfreeze Distribution Corp.	H254	Electric Furnace Company	F405
Delaware Tool Steel Corp.	C211	Electric Products Co.	H202
Delta Power Tool Division	A319	Electro Arc Manufacturing Co.	H508
Detrex Corporation	G351	Elgin National Watch Co.	H235
Detroit Edison Company	F461	Electro-Alloys Division, American Brake Shoe Co.	F339
Detroit Electric Furnace Division	A260	Elox Corporation	G239
Detroit Stamping Co.	H306	Empire Products, Inc.	H520
Detroit Testing Machine Co.	B127	Engelhard Industries	A363
Diamond Iron Works, Inc.	H236		A301
Die Casting (publ.)	G440		G240
Dietert Company, Harry W.	B244	Engineered Castings Division, American Brake Shoe Co.	F339
Distillation Products Industries Division	D236	Engis Equipment Company	B223
Diversey Corporation	G346	Ercana Corporation	B243
Diversified Metal Products Co.	H224	Erico Products, Inc.	H158
DoAll Company	H305 and H406	Eutectic Welding Alloys Corp.	F403
Dow Chemical Co.	F222		
Dow Furnace Co.	A349		
Drever Co.	C229		
Driver Co., Wilbur B.	A305		
Dupont de Nemours & Co., E. I.	F356		
E			
East Shore Machine Co.	H111	Fahrlaloy Co.	H151
Eastman Kodak Co.	D236	Fawick Airflex Co., Inc.	G251
Eaton Manufacturing Co.	H357	Ferner, Co., R. Y.	B218
Eclipse Fuel Engineering Co.	G162	Firth-Sterling Steel & Carbide Corp.	G446
Elastic Stop Nut Corp. of America	D223	Fiske Brothers Refining Co.	C232
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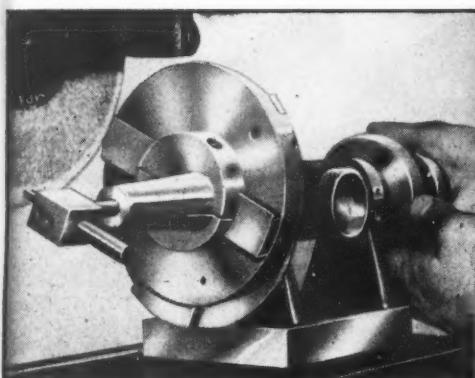
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Gas Appliance Service, Inc.	G158	Higbie Manufacturing Co.	C237
Gehringer & Forsyth	D140	Hilger, Ltd., Adam	B146
General Alloys Company	A336	Hitchiner Manufacturing Co.	H264
General Aniline & Film Corp.	G451	Hobart Brothers Co.	D138
General Controls Co.	G164	Holcroft & Company	G245
General Electric Company	A102	Holden Co., A. F.	F406
General Electric X-Ray Corp.	F250	Hones, Inc., Charles A.	G265
General Plate Co.	D109	Hoskins Manufacturing Co.	F217
Goodrich Co., B. F.	C212	Houghton & Company, E. F.	F306
Gordon Co., Claud S.	H352	Howard Foundry Co.	C138
Graham Manufacturing Corp.	H257	I	
Gray Grimes Tool Co.	H154	Illinois Testing Laboratories, Inc.	B224
Gulf Oil Corporation	D230	Industrial Cable & Sling Co.	H251
H		Industrial Gas Division, Liquid Carbonic Corp.	D114
H. & H. Research Company	A205	Industrial Heating (publ.) Industrial Publ. Co.	C239
H. & H. Tube & Mfg. Co.	D314	Industrial Heating Equipment Co.	D320
Hammond Machinery Builders, Inc.	F211	Industrial Press	H128
Hanchett Magna-lock Corp.	H120	Industrial Publishing Co.	G440
Handy & Harman	F315	Industry & Welding, Industrial Pub. Co.	G440
Harnischfeger Corporation	G415	Institute Dr. Foerster	B136
Harper Electric Furnace Corp.	C204	International Mechanical Engineering Congress	H519
Harshaw Chemical Company	A220	International Nickel Co., Inc.	A328
Haynes Stellite Co.	F440	Invincible Vacuum Cleaner Mfg. Co.	H123
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LIST OF EXHIBITORS Continued

Company	Booth
Janney Cylinder Company	G315
Jarrell-Ash Company	B11
Jensen Specialties, Inc.	D215
Johansson Gage, Co., C. E.	B226
Johnson & Son, Inc., S. C.	G316
Jones Co., C. Walker	A145
K	
K S M Products, Inc.	G321
Kalamazoo Tank & Silo Company	F416
Kanthal Corp.	G352
Kearney & Trecker Corp.	A240
Kelite Products, Inc.	H253
Kemp Manufacturing Co., C. M.	G144
Kennametal, Inc.	G252
Kentucky Agricultural & Industrial Development Board	H155
Kerns Company, L. R.	A199
Keuffel & Esser Co.	H206
King, Andrew	B122
Kold-Hold Manufacturing Company	G345
Kolene Corporation	A315
Kropp Forge Co.	D222
Kuhiman Electric Co.	A260
Kux Machine Company	A122
L	
Laboratory Equipment Corp.	B247
Lake Shore Engineering Co.	B134
Lapeer Mfg. Co.	H157
Last Word Sales Co.	H154
Leeds & Northrup Company	F351
Leitz, Inc., E.	B211
Lepel High Frequency Laboratories Inc.	G145
Lincoln Electric Co.	F348
Lindberg Engineering Company	F340
Liquid Carbonic Corp.	D114
Livingstone Engineering Company	B228
Loftus Engineering Corp.	G125
Los Angeles Chamber of Commerce	G215
Los Angeles Dept. of Water & Power	G215
Lubriplate Division, Fiske Bros. Refining Co.	C232
Lynchburg Foundry Company, Machinery (publ.)	D337
Industrial Press	H128
M	
Magnaflux Corporation	G339 and G230
Magnethermic Corporation	G234
Magnetic Analysis Corp.	B231
Mahr Manufacturing Co., Div.	H236
Makepeace Co., D. E.	A301
Manufacturers Processing Co.	H110
Martindale Electric Co.	C201
Marvin Machine Products, Inc.	F416
May Fran Engineering	H541
Master Builders Company	C131
McGraw-Hill Publishing Co., Inc.	G256
Mechanical Air Controls, Inc.	H340
Mechanics Laundry Co.	D303
Merrill Brothers	C134
Metal Products Sales Co.	H264
Metal Progress, ASM National Office	H323
Metal Removal Co.	H126
Metals & Controls Corporation	D109
Metals Finishing Corp.	H526
Metals Review, ASM National Office	H323

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ELMIRA, N.Y.

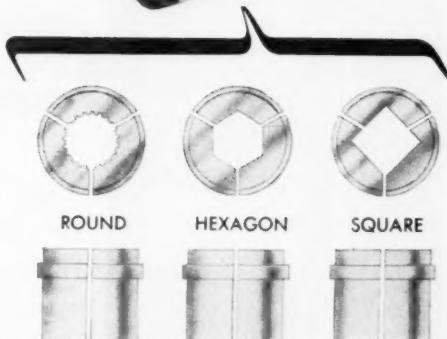
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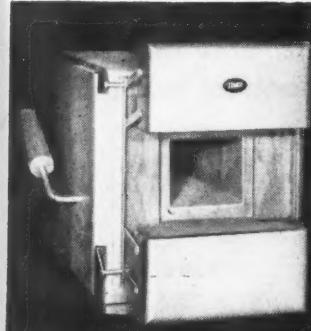
LIST OF EXHIBITORS Continued

Company	Booth	Company	Booth
Michigan Products Corp.	A312	Office Technique Pour L'Utilisation de L'Acier	H521
Michigan Bell Telephone Co.	F401	Oakite Products, Inc.	D309
Michigan Industrial Gas Corp.	H210	Ohio Crankshaft Company	G246
Michigan Steel Casting Co., Micracast Division	G409	Ohio Overall Cleaning Co.	D303
Austenal Laboratories, Inc.	B142	Olsen Testing Machine Co., Tinus	D216
Miller & Taylor Tool Co.	G456	Oppen Co., Inc.	B138
Milne & Company, A.	A356	Osborn Manufacturing Co.	D118
Mir-O-Col Alloy Co., Inc.	A316	Ozalid Division	G451
Modernair Corporation	H315		
Morton Gregory Corp.	G202		
Mueller Brass Co.	H241		
Multifinish Manufacturing Co.	H247		

N

National Carbon Co.	F440
National Cored Forgings Co., Inc.	F254
National Cylinder Gas Co.	G112
National Diamond Laboratory	C210
National Industrial Publishing Co.	C239
National Lead Company	F449
National Radiator Co.	H109
National Research Corporation	A309
National Spectrographic Laboratories	B146
National Time & Signal Corp.	B238
National Torch Tip Co.	H148
Nelson Stud Welding Div.	G202
New Hermes Engraving Machine Corp.	H108
New Jersey Zinc Company	A162
Niagara Blower Co.	G422
North American Philips Co., Inc.	A220
Nox-Rust Chemical Corp., O. T. U. A.	H417

Pangborn Corporation	G421
Park Chemical Co.	F456
Parker Rust Proof Co.	H339
Peabody Industries	H214
Penton Publishing Company	G340
Peters-Dalton Co.	G355
Phillips Manufacturing Co.	A355
Physicists Research Company	D135
Picker X-Ray Corporation	F411
Platcoil Division, Kold-Hold Mfg. Co.	G345
Powdered Metal Products Corp. of America	A118
Power Ball Oil Co.	A105
Precision Metalsmiths, Inc.	B123
Precision Spring Corp.	A214
Precision Welder & Machine Co.	H364
Product Engineering (publ.) McGraw Hill Publishing Co.	G256
Product Engineering & Mfg. Corp.	H221
Production Machine Company	F225
Pyrometer Instrument Co., Inc.	B108



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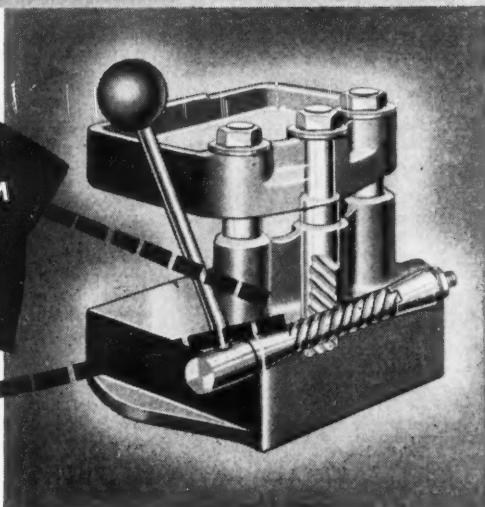
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LIST OF EXHIBITORS Continued

Company	Booth	Company	Booth
	R		
RCA Victor Division	D324	Seal-Peel, Inc.	A320
RCS Tool Sales Corp.	H316	Selas Corporation of America	G148
Radio Corporation of America	D324	Sentry Company	A109
Ransburg Electro-Coating Corp.	G445	Service Diamond Tool Co.	G117
Rapids-Standard Co., Inc.	H121	Sheldon Machine Co., Inc.	A155
Raytheon Manufacturing Company	A255	Sherman & Co.	D129
Ready Power Co.	G131	Sinclair Refining Co.	H358
Reeves Pulley Company	A360	Smith Corp., A. D.	H524
Reliance Electric & Engineering Co.	A360	Smith Welding Equip. Corp.	A208
Rem-Cru Titanium Co., Inc.	G310	Socony-Vacuum Oil Co., Inc.	G221
Reynolds Metals Co. (outdoor space)	F325	Solventol Chemical Products Inc.	A202
Richard Brothers Division, Allied Products Company	F302	Sonoflux Corporation	H146
Richards Co., J. A.	H152	Sparkler Mfg. Company	A218
Riehle Testing Machines Division	B246	Special Libraries Association-Metals Section	H424
Robotron Corporation	H535	Spencer Scientific Instruments	B128
Rockwell Manufacturing Co.	A319	Spencer Turbine Co.	G260
Roleck, Inc.	D140	Sparry Corporation	G109 and D115
Ross Operating Valve Co.	B232	Sperry Products, Inc.	D115
Rossi, Irving, Scovill Mfg. Co.	G459	Standard Alloy Co.	D140
	S	Standard American Engineering Company	D110
Sand Machinery Co.	G330	Standard Diamakers Supplies	H328
Safety Clothing & Equipment Co.	G462	Standard Electric Tool Co.	G210
Sales Service Machine Tool Co.	A219	Standard Oil Co. (Indiana)	D130
Schenck, Carl (Darmstadt, Ger.)	B218	Standard Steel Treating Co.	H139
Schrader's Son Division, A.	G309	Standard Tube Company	A216
Sciaky Bros. Inc.	G318	Starratt Co., L. S.	C123
Scott & Son, Inc., C. U.	H243	Steel (publ.) Penton Publishing Co.	G340
Scovill Manufacturing Co.	G459	Steel City Testing Machines, Inc.	G220
		Stevens, Inc., Frederick B.	D330
		Stokes Machine Co., F. J.	A158

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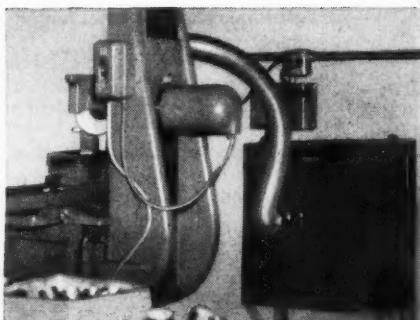
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LIST OF EXHIBITORS Continued

Company	Booth
Stone Machinery Co., Inc.	A359
Stuart Oil Co., Ltd., D. A., Sub Zero Products Mfg. Div.	A266
Deepfreeze Distributing Corp.	H254
Sunbeam Corporation	F256
Surface Combustion Corporation	F240
Syntron Company	H135
T	
Tagliabue Instruments Div., Weston Elec. Instrument Corp.	B227
Templ Corporation	C117
Tenant Co., G. H.	H530
Texas Company	C103
Tin Research Institute, Inc.	B236
Tincher Products Co.	C228
Tinnerman Products, Inc.	C207
Tocco Induction Heating Equip. Division, Ohio Crankshaft Co.	G246
Tool Engineer (publ.) Amer. Society of Tool Engineers	H245
Tracerlab, Inc.	B118
Trent Tube Co.	G310
Trerice Co. H. O.	B245
Tri-Clover Machine Co.	H346
U	
Uddeholm Company of America	B116
Udylite Corp.	D330
Union Carbide & Carbon Corp.	F440
United Chromium, Inc.	B132
U. S. Air Forces-Materials Research	H136
U. S. Electrical Motors, Inc.	D302
U. S. Gypsum Company	H143
Universal Castings Corp.	G115
Universal-Cyclops Steel Corp.	F247
Univertical Machine Co.	H348
Upton Electric Furnace Co.	C102
V	
Vanadium-Alloys Steel Company	D345
Vapofier Corporation	C109
Vickers, Inc.	G109
Victor-Peninsular Div., Allied Products Company	F302
Vlier Mfg. Co.	B204
W	
Walder-Scott, Inc.	G101
Walker-Turner, Div.	A240
Wall Colmonoy Corp.	C243
Warner Division, Clinton Machine Co.	H546
Webber Appliance Co., Inc.	H248
Weldit, Inc.	H545
Wells Manufacturing Corp.	D209
Wells & Sons, W. F.	H117
Weltronic Company	G224
Western Sealant of Detroit, Inc.	C118
Westinghouse Electric Corp.	G430
Weston Electrical Instrument Co.	B227
Wheelco Instruments Company	D219
Wilson Carbon Co.	B220
Wilson Mechanical Instrument Division, American Chain & Cable Co.	A342
World Raw Materials Congress	H519
Worthington Pump & Machinery Co.	G455
Wynn Oil Co.	H124
Z	
Zeiss, Inc., Carl, Ercona Corporation	B243

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The Walton Company has added *Walton-American Tool Holders* to its line of time-and-labor-saving tools — the well known *Walton Tap Extractor* and its companion *Reps Pipe and Stud Extractor*.



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Universally used for removing stubborn, balky taps that break off deep in threaded work. Quick, easy, inexpensive. Will not damage threads.

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Many holders in one. Head will swivel around an entire circle. May be set for straight, right or left-hand offset positions. Will hold with perfect grip any size square or round tool bit or boring bar.



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Please send your new catalog of Walton Tools with full details of free trial offer.

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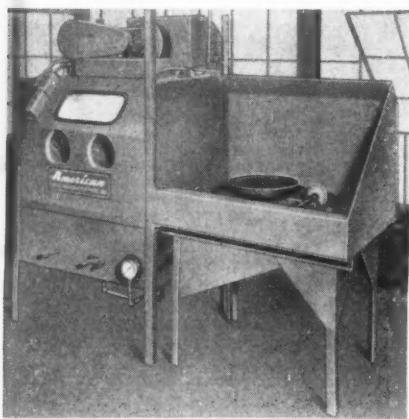
City _____ State _____

Street _____

On Exhibit at

Processing products used in defense manufacturing plant will be featured in Booth No. F-306 E. F. Houghton & Co., Philadelphia 33, Pa., maker of metal-working and heat-treating products, lubricants, and packings. Special emphasis will be placed on various major defense items, with display boards showing operations necessary to make gun tubes, small arms, shells, rocket tubes, A. P. shot, and so on. The application of Houghton cutting oils, heat-treating salts, cleaners, rust preventatives, forging agents, and special lubricants in each of these fields will be depicted. New products which have been developed or revised within the past year and which will be given special emphasis at the show include a phosphate type cleaner in the Houghto-Clean series, dry film type drawing compounds in the Houghto-Draw series, new government specification rust preventives recently approved, a new grinding solution which contains no mineral oil, and a new type of rubber impregnated leather packing. A demonstration of Antisep All-Purpose Cutting Base on a nut tapper in production work will also be featured.

"A Parade of Production Ideas" will be the theme of the exhibit in Booth No. G-430 sponsored by the Westinghouse Corp., Pittsburgh 30, Pa. The "Parade" will feature metal-hardening equipment for continuous, high-speed production. The display will include the Inductall, a high-speed automatic-indexing radio-frequency induction-heating machine for hardening a wide range of gear sizes. Also shown will be an improved model of the horizontal scanner for the continuous production-line selective hardening of cylindrical shafts from $\frac{1}{8}$ to 2 inches in diameter and from 3 to 18 inches in length. Also to be exhibited are Type RA selenium rectifier d.c. welding machines with arc drive control; Phos-Copper brazing alloy for brass and copper; a working model of a brazing furnace; a comparator which indicates magnetic properties of different magnetic materials; standard control equipment built to J.I.C. specifications, including line starters, push buttons, safety switches, and other equipment; and three portable engine-driven d.c. welding machines.



Known as the "Liquamatte," a new wet blast machine with many special features for improved operation and reduced maintenance will be shown in Booth No. F-439 by American Wheelabrator & Equipment Corp., Mishawaka, Ind. Features of the unit include a vertical pump for slurry recirculation. The machine has a conveniently low work ceiling; however, the bottom of the unit is high enough off the floor to allow for easy cleaning under the machine. The armholes are equipped with gauntlets so that every workman can use his own gloves and small work can be passed through the armholes without opening the doors. A reset timer is available on the machine for telling at a glance the number of blasting hours that the abrasive has been in the machine. As a safety feature, the machine height is such that the average operator will be able to stand on the floor, with no platform needed.

the Metal Show

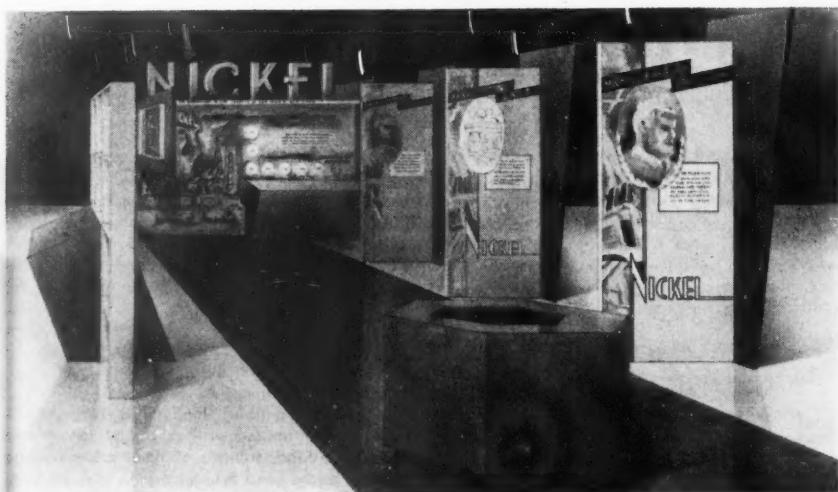
In Booth No. F-225, the Production Machine Co., Greenfield, Mass., will exhibit, for the first time, its new No. 914 Centerless Grinding and Finishing Machine using wet abrasive belts. Designed to handle work up to 6 inches in diameter of any length and adjustable for any size stock within its capacity, the machine, in conjunction with an idler backstand, uses abrasive belts 9 inches wide x 168 inches long and has a self-contained coolant system. In addition, the company will exhibit and demonstrate the No. 484 Single and No. 484 Duplex Centerless Polishing and Finishing Machine using abrasive belts for grinding and finishing and felt belts for polishing and buffing.

Intended to be of interest to large and small manufacturers, Booth No. F-315 of Handy & Harman, New York 38, N. Y., will show a high speed gas-air heated production job operating, as well as a torch heating table in action, demonstrating the fundamentals of silver alloy brazing and showing how a torch can do a few parts in fast time or be used for repairs on tool tipping. There will also be an interesting collection of typical silver alloy brazed domestic and defense jobs on display. The full story of how Handy & Harman is prepared to render service throughout the country will be presented in detail. Experienced engineers will be attendance, ready to talk over production problems, and the company intends to braze any sample parts brought to the booth during the course of the show.

Included in Booth No. B-223 of the Engis Equipment Co., Chicago, Ill., will be the Taylor-Hobson "Javelin" Etcher illustrated herewith, which is designed to rapidly, economically, and uniformly mark tools, gages, parts for automobiles, aircraft, engines, and machinery, as well as cutlery and other consumer merchandise. The machine is said to mark hard or soft metals—flat or curved surfaces—with identifying numbers, names, trade marks, or designs, handling up to 15 workpieces at a time. The marking is produced by means of a series of minute electric arcs, formed at the point of a rapidly vibrating electrode linked into a pantograph, which controls the 15 "javelins" and can be readily guided in specially prepared intaglio "copy" by a single unskilled operator.



ON EXHIBIT AT THE METAL SHOW



Keynote of the display in Booth No. A-328 of The International Nickel Co., Inc., New York 5, N. Y., will be the versatility of nickel as an alloying element. From ordnance and supporting industry, examples will be shown of established applications of nickel in cast iron, steel, and stainless steel and in nickel silver, 70-30 and 90-10 cupro-nickel. A wide variety of successful applications of the new engineering material, Ductile Iron, will be displayed in thick and thin sections. Platinum metals will likewise be exhibited.

Aronson Machine Co., Arcade, N. Y., will exhibit a new welding positioner featuring precision rotation and fast positioning. To show these features, the company is planning to set up an electrical control panel so that all visitors can manipulate the positioner to see its advantages. One of these Model 21 Welding Positioners is being made for a leading aircraft plant where tolerances in welding stainless steel sheet metal must be held to 0.015 inch. The positioner includes a gear-driven mechanism which will permit the workpiece to be raised and lowered quickly to the desired position without moving the welding head. Aronson's booth is No. C-127.

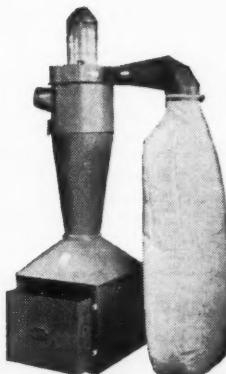
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Avoid costly accidents caused by slipping on oily or greasy floors! Reduce fire hazards! Replace sawdust or wood shavings with Fuller's Earth. Every shop needs this low-priced safety aid. Fuller's Earth absorbs oil and grease—and it's non-inflammable. Write for FREE SAMPLE to test.

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**You've got the "Number"
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Here you are folks. Step right up and watch the sparks and dust go 'round and 'round. Off the wheel they fly, but not into machinist's eyes.

You hold the winning number when dust-creating machines are equipped with Torit Dust Separators. Compact and powerful, they trap dust at its source. Heavy particles are removed by centrifugal action and, with after-filter as shown, the remainder is cleaned to permit recirculation of the air.

Keep production spinning with Torit dust collecting equipment. There are models and sizes for every standard machine. For complete information and latest Torit catalog, write:

TORIT

Manufacturing Co.

296 Walnut Street St. Paul 2, Minn.

ON EXHIBIT AT THE METAL SHOW

Cadillac Stamp Co., Detroit 12, Mich., will exhibit some of its most important metal marking equipment in Booth No. H-258. Among the equipment to be shown in operation will be the Cadillac 45 Hydraulic Marking Machine, which is a compact self-contained manifold-mounted

hydraulic unit with one control for governing the full range of pressure from very light marking to extra heavy marking. The machine has a maximum capacity of up to 110 1-inch impressions per minute. Also to be shown is the Automark Automatic Marking Machine, an air-operated marking unit which is said to be especially adapted for light, flat marking. The machine can also be readily adapted for high speed color marking by the branding method and requires no special jigs or fixtures for average work. The machine has automatic controls for high production and is well guarded for complete safety to hands. Another piece of equipment to be exhibited will be the Automark Electrical Metal Marking Typewriter which is said to be ideal for the detailed marking of name plates, as well as for other uses. The same type intaglio marking can be produced on materials other than metal. In addition to the three machines mentioned above, the company will also show other components in its line of metal marking devices.



Speedi-Dri-Corp., Philadelphia, Pa., will introduce a new, lighter oil and grease absorbent, known as "Super-Sol-Speedi-Dri," which will be exhibited in Booth Nos. 122 and 123 by Waverly Petroleum Products Co., Philadelphia, Pa., distributor of Sol-Speedi-Dri products in all parts of the country except New England, New York, eastern Pennsylvania, and southern New Jersey.

In Booth No. A-109, The Sentry Co., Foxboro, Mass., will feature an on-the-spot demonstration of the hardening of molybdenum types of high-speed steel now required as substitutes for the former popular tungsten types. Using the Diamond Block Method of Atmospheric Control, the company will show pieces being hardened with complete freedom from either scale or decarburization. Other equipment will also be on display.

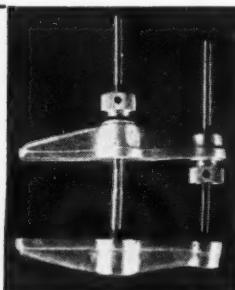
Monarch VISE ACTION CLAMP

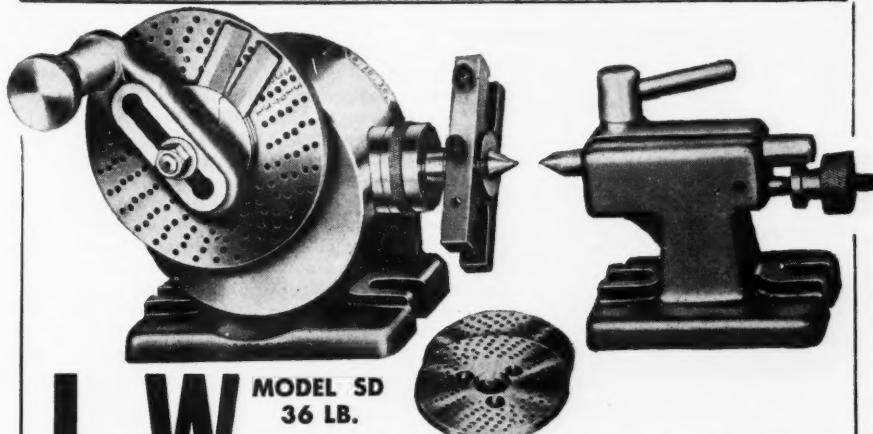
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Grips the Work Straight—Like a Vise—Without Side Slipping.
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Heavy duty headstock and tailstock designed for maximum rigidity. Alloy steel threaded headstock spindle with extra large tapered bearing and takeup adjustable collar. Head tilts to 90° in vertical position. Alloy stress-proof steel worm and

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Model BP 11" Swing for \$199.54
plain milling machines.
Shipping weight, 140 lbs....



Model AU 11" Swing,
Fully Universal for
complete indexing
and spiral cutting.
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ALL OUTSTANDING VALUES BY AMERICA'S LARGEST BUILDERS OF DIVIDING HEADS

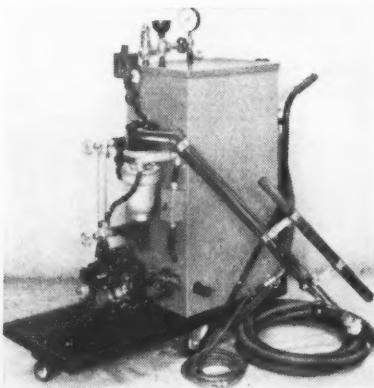
Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



L-W CHUCK COMPANY

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ON EXHIBIT AT THE METAL SHOW



The "Speedylectric" Model JC-25 Steam-Jet Cleaner for the cleaning of machine tools, windows, equipment, and light fixtures at steam pressures up to 200 p.s.i. will be shown in operation in Booth No. B-228 by the Livingstone Engineering Co., Worcester 5, Mass. Measuring 16 inches wide x 48 inches long, the unit is designed for maximum portability in close quarters and is completely self-contained, with space provided on the all-steel truck to mount a water tank of sufficient capacity for three to four hours of continuous operation. The cleaner utilizes hot steam from a built-in high pressure boiler to provide the desired cleaning action, the steam being mixed with small quantities of solvents and applied as a powerful jet under finger-tip control of the operator.

The Lindberg Engineering Co., Chicago 13, Ill., will feature an "International Theatre" in Booth No. F-340. This unique theatre will show "Stereo Realist" third dimension color slides, taking the spectator for a global trip to famous historical, scenic spots, and installations of Lindberg heat-treating equipment throughout the world. Specially required polaroid glasses will be presented to the guests for viewing the stereo slides.

WILTON
The Finest Name In Vises

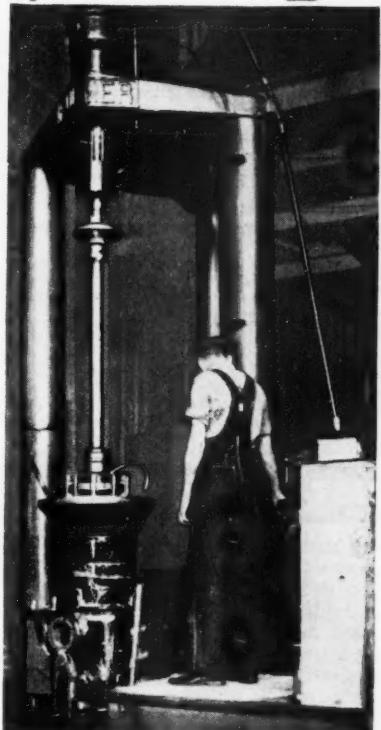
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the bore of
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15 sizes, diameters from
 $\frac{1}{4}$ " to 30" with strokes
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designed for your special
purposes

PHOTO shows a Fulmer Vertical Honing Machine honing the bore of a gas engine cylinder, being built by the Continental Gin Co. The Fulmer vertical honing machine is equipped with a hone of 14 inches diameter and finishes the bore to within 0.002 inch limit of finish size and to a maximum surface variation of 35 to 45 micro inches. After the honing operation has been completed, the bore is gaged to make sure it is within the specified limits for diameter. **EXTREME ACCURACY AND FAST PRODUCTION ARE ASSURED.**

ONLY FULMER can furnish COMPLETE
honing equipment FOR ALL SIZES.

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C. ALLEN FULMER CO.

1233 First National Bank Bldg.
Cincinnati 2, Ohio

ON EXHIBIT AT THE METAL SHOW

An operating pill press, that will demonstrate automatic quantity production of carbide blanks, will be one of the many interesting features of the exhibit in Booth No. H-218 sponsored by the Adamas Carbide Corp., Harrison, N. J. The exhibit will also include complete displays of the actual Adamas line of tungsten carbide tool tips, dies, and wear parts. The Adamas staff at the show will include qualified carbide engineers capable of dealing with the cutting and wear problems of the carbide users visiting the booth. Photographs will be used to show the production and quality control facilities available at Adamas to carbide users, as well as interesting applications of tungsten carbide.

The Alvey Ferguson Co., Cincinnati 9, Ohio, will exhibit its A-F Washing and Processing Machines for industry in Booth No. H-502. Representatives from the home office will explain the many applications of A-F equipment for cleaning and processing metal parts and products in the rearmentation program.

Two automatic riveting machines using $\frac{1}{8}$ -inch body diameter tubular rivets in conjunction with a 12-station synchronized indexing fixture will be demonstrated in Booth No. G-214 by the Chicago Rivet & Machine Co., Bellwood, Ill. A solenoid tripping mechanism with micro-switch and Graham speed reducer enables the operator to completely control speed of machines. Also to be demonstrated will be an automatic rivet setting machine with double-action rivet setting mechanism which cushions the riveting blow so that rivets can be successfully used in fastening ceramic, plastic, and bakelite assemblies. A total of four riveting machines will be in constant operation.



"Stack Up"



Sterling Bin Front "Top Rim"
Steel Stacking Box.
Size: 18" x 12" x 6".



Sterling "Top Rim" Steel Stack-
ing Box with drop handles.
Size: 18" x 12" x 6".

THESE BOXES AGAINST ANY!

Once you use and compare Sterling stacking boxes, you'll know why we invite comparison in design, construction, and price. Our "Top Rim" construction provides stronger support all around the box . . . no corner inserts to become loose and fall out. Efficiency in designing and manufacturing allows us to quote favorably on any type or size stacking box.

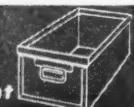
Write for literature and prices.

Sterling Factory Equipment Co., 183 Charles St., Providence, R. I.



Sterling

Quality Handling & Storage Equipment

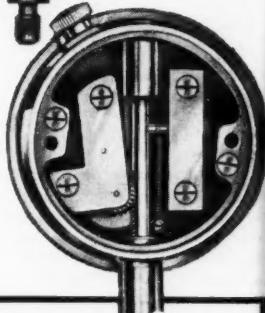
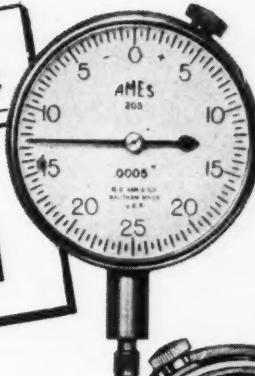


Modern Design

SPEEDS PRODUCTION

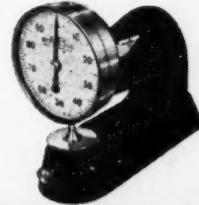
● Ames micrometer dial indicators are the most modern available today — and naturally so because Ames policy for over 50 years has been continually to improve design, to take advantage of new materials and to utilize the most advanced manufacturing methods. They are a real aid to the quality control engineer who is trying to keep pace with today's high production schedules.

Because Ames Indicators are functionally designed, they have fewer parts than ordinary indicators. Construction is simple with functional parts being larger and more rugged and adequately supported. Operational friction is at a minimum. Thus, Ames Indicators combine extreme sensitivity and accuracy with the ability and endurance *to stay right on the job longer.*



✓ Check this list of features . . .

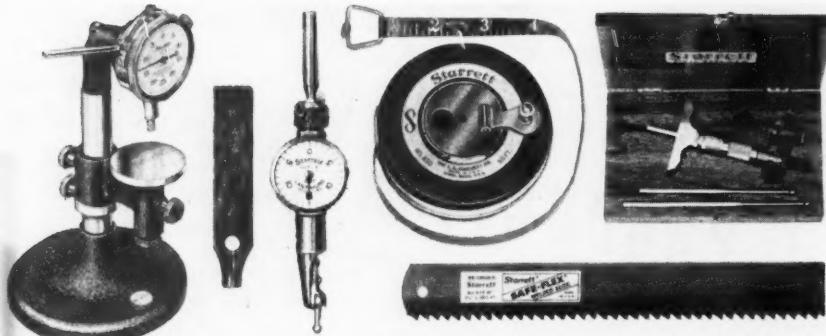
- 1 Forged Solid Brass Case and Stem
- 2 Heavy Brass Plate
- 3 Coarse Pitch Stainless Steel Rack
- 4 Hardened and Burnished Steel Pivots
- 5 Dials Printed from Steel Engravings
- 6 Patented Bezel Assembly



Representatives in
principal cities.

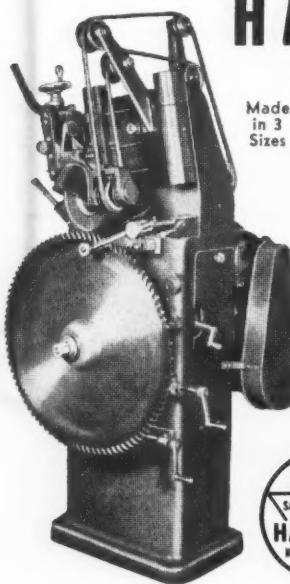
B. C. AMES CO. 29 Ames Street
Waltham 54, Mass.
Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

ON EXHIBIT AT THE METAL SHOW



The exhibit in Booth No. C-123 of The L. S. Starrett Co., Athol, Mass., will include a general display of mechanics' hand measuring tools and precision instruments, dial indicators, steel tapes, hack saws, band saws, band knives, and precision ground flat stock. New tools to be exhibited will comprise a line of precision steel tapes featuring streamlined cases and built-in tape hooks; micrometer depth gages with satin chrome finish, blade type rods, and 2½ and 4-inch bases; double-welded power hack saw blades combining hardness and toughness for safe, shatterproof, high speed production cutting; Starrett No. 711-E "Last Word" test indicator with universal friction holder and universal shank; and universal dial bench gage with sliding table and fine adjustment.

HANCHETT METAL SAW SHARPENERS



Made
in 3
Sizes

Here is an accurate, long-lived machine designed for automatic grinding of cold metal cutting saws. Rigid, solid construction with ball-bearing mounted head slides and controlled cam action.



Two Views of
High and Low
Toothed Metal
Cutting Saws

FOR INSERTED TOOTH, SEGMENTAL
TYPE, SOLID TOOTH CIRCULAR SAWS
SAW CAPACITIES 8 in. to 72 in. and larger

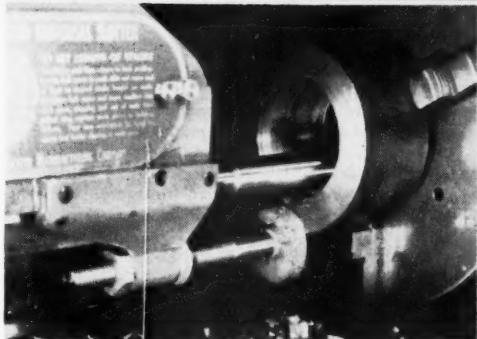


HANCHETT MANUFACTURING CO.

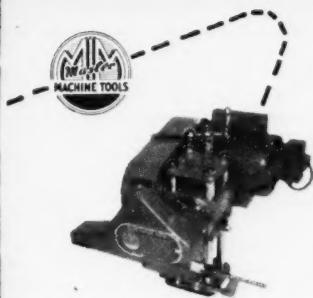
Main Office—Big Rapids, Mich.
West Coast—Portland, Ore.

World's Largest Manufacturers of Shear Blade,
Knife and Saw Grinding Machinery

more OPERATIONS ON YOUR LATHE, TURRET, OR MILL with **MASTER MACHINE TOOL ATTACHMENTS**



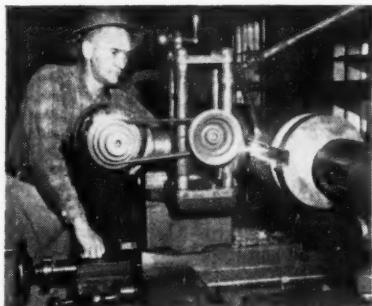
INTERNAL KEYWAY CUTTING WITH
MASTER SLOTTING HEAD ON A LATHE



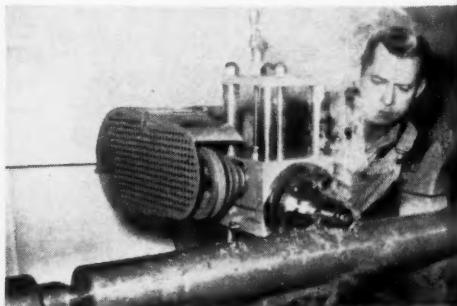
*Master Universal
Slitting and Keyseating Head*

The multi-purpose Master milling, grinding and keyseating attachments increase the facilities and capacity of your lathes, turrets, or mills, in maintenance shops, tool rooms, as well as production shops. For the cost of one single-purpose machine, you can have several Master units producing on your present equipment.

THREE SIZES: Model "C," $\frac{1}{3}$ h. p. for 9" to 13"; Model "B," $\frac{1}{2}$ or $\frac{3}{4}$ h. p. for 13" to 18"; Model "M," 1 or $1\frac{1}{2}$ h. p. for 18" to 72" swing lathes.



END MILLING $2\frac{1}{2}$ " KEYWAY IN $9\frac{1}{8}$ "
SHAFT 22 FT. LONG



1 $\frac{1}{2}$ H.P. MODEL "M" ON LATHE MILL-
ING $\frac{1}{2}$ " KEYWAY 1 FT. PER MINUTE

WRITE FOR TWENTY-FOUR PAGE CATALOG

MASTER MANUFACTURING CO.
1302 EAST AVENUE A ■ HUTCHINSON, KANSAS, U. S. A.

ON EXHIBIT AT THE METAL SHOW

Features of the exhibit in Booth No. C-131 of The Master Builders Co., Cleveland 3, Ohio, will include abrasion tests of the Masterplate iron-clad concrete floor and ordinary concrete floors using apparatus of the type developed by the National Bureau of Standards for determining the comparative wear of all types of concrete floors. Other tests will be conducted showing the spark-resistant, static-disseminating properties of the Masterplate floor, widely used in industrial plants and other places in new construction and for resurfacing wornout concrete floors. In addition, there will be displays demonstrating the advantages of Embeco non-shrink mortar for grouting machinery and heavy equipment and its 21 other principal uses.

The complete display of induction heating products formerly exhibited on the company's "More Power to America" special exhibit train will be featured in Booth No. A-102 by the General Electric Co., Schenectady 5, N. Y. Rivaling this display in the G. E. exhibit area will be the premiere demonstration of the company's new Fillerweld process. Just announced, this process is designed to speed manual alloy-to-metal welding where filler metal must be added. These and other exhibits showing products of G. E.'s Welding, Industrial Heating, and Meter & Instruments Divisions will cover 975 feet of floor space. The exhibits will include an operating display of an enlarged replica of G. E.'s 400-amp. a.c. indoor welder; a king-size transparency of the continuous tinplate annealing furnace supplied by G. E. for the Gary, Ind., plant of the United States Steel Company; a display of the new G. E. pyrometer equipment, used for accurate temperature indication, close temperature control and protection of furnaces, ovens and kilns; a display of the G. E. inert arc welded, several other types of welders, and flow control; panels describing Calrod soldering and surface, soft metal, liquid, process, and pipeline heating; displays of heating cable, melting pots, air heaters and allied products; a switchgear display of G. E. double-pole welding breakers; and showings of the picture, "The Story of A.C. Welding."



**CLOSE-TOLERANCE
DRILL-JIG BUSHINGS
AND GAGES MEET YOUR
HIGHEST STANDARDS**

All A. S. A. standard types and sizes are in stock, ready to fill your order. And if you need new gages or gages salvaged by hard chromium plating, you can also depend on fast delivery. Write for bulletin and price list.

Economy TOOL & MACHINE CO.

1827 SOUTH 68th STREET • MILWAUKEE 14, WISCONSIN



You can cut
**ANY MACHINABLE
MATERIAL**

from wood to hard
steel with these
rugged, gang-cutting
hole saws

**40
SIZES**
from $\frac{5}{8}$ "
to $4\frac{1}{2}$ "

**Cut big holes
faster and cheaper
with new, high-speed**

BLU-MOL® HOLE SAWS

Super high-speed
**WELDED
EDGE**
on extra tough
alloy steel
back

Cut up to
 $1\frac{1}{8}$ "
DEPTH
in solid
material

NEW FOLLOW-THROUGH TYPE

Ideal for stacked
material or
cutting through
partitions

WRITE FOR FULL DETAILS

— or let us arrange for a
demonstration. See for yourself
how these new, ultra high-speed
"Blu-Mol" Hole Saws can save
you time and money on many
maintenance and production
operations.

Millers Falls Company
Greenfield, Mass.

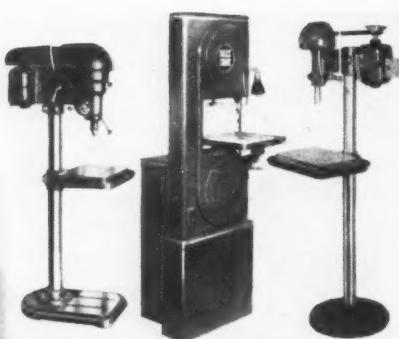
**MILLERS FALLS
TOOLS**

SINCE
1868 ®

"Blu-Mol" Hole Saws are
part of the world's broadest
and most highly developed
line of metalcutting saws.

The Mark of Superiority

ON EXHIBIT AT THE METAL SHOW

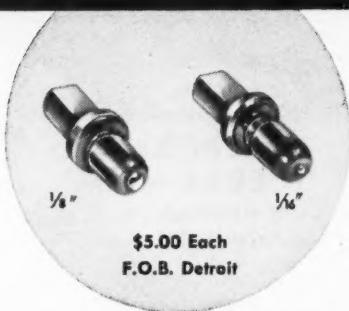


Boice-Crane Co., Toledo 6, Ohio, will exhibit in Booth No. A-141 14-inch band saws and two lines of drill presses— $\frac{1}{8}$ -inch capacity and new $\frac{1}{2}$ -inch capacity 15-inch machines. Various models of the basic eight-speed band saw will be shown contour sawing metals and other materials; continuous band filing contour work as applied both to toolroom and production; and abrasive band finishing workpieces. Operating under power will be both single and multiple spindle drilling and tapping units in the two drill press lines, which are available in over 100 models varying as to floor or bench types, high and low speed, spindle type, work arbors, and one, two, three, or four spindles.

Welding positioners, turning rolls, and All-Speed Selectors will be exhibited by Worthington Pump & Machinery Corp., Harrison, N. J., in Booth No. G-455. Representative sizes of Worthington-Ransome's full line of welding positioners and turning rolls as well as All-speed Selectors will be in operation by representative.

FOR GREATER HARDNESS TESTER ACCURACY *Specify CLARK STEEL BALL PENETRATORS*

• For dependably accurate hardness testing, every part of your testing equipment must be designed by experts. CLARK Hardened Steel Ball Penetrators are designed to give the most accurate possible results in the testing of soft metals such as unhardened steel, cast iron, brass, bronze, and similar metals and alloys. They are available in $1/16$ " and $1/8$ " diameters at \$5.00, and in $1/4$ ", $1/2$ ", $3/4$ " and 1" diameters at slightly higher prices. Specify CLARK Steel Ball Penetrators for more accurate "Rockwell" testing.



CLARK
TOMORROW'S ACCURACY TODAY
CLARK
INSTRUMENT, INC.
10200 Ford Road Dearborn, Mich.

**For Uniform, Constant Pressure on
Any Size or Type of Installation**



OIL-RELIEF VALVES

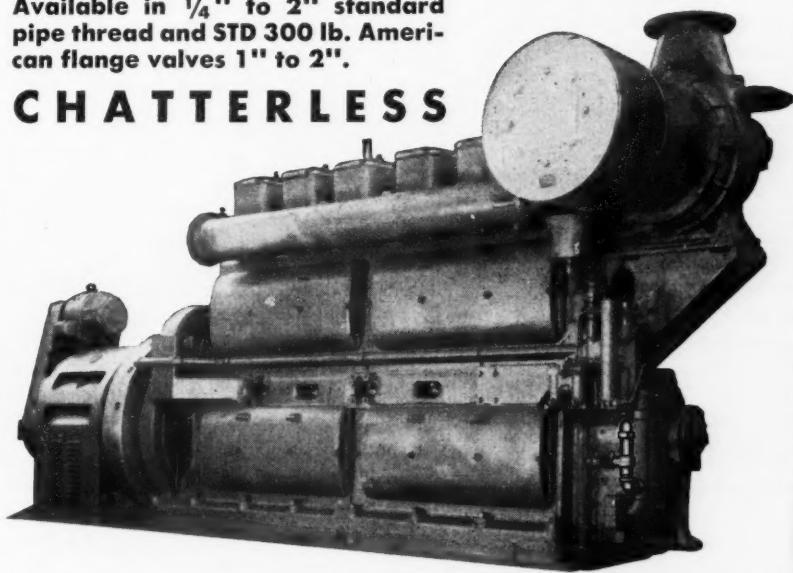
Do a Good Job!

Regulating oil pressure is always mighty important because the life of your equipment actually depends on it. FULFLO OIL-RELIEF VALVES are installed easily, quickly and just where needed and wanted.

Available in $\frac{1}{4}$ " to 2" standard pipe thread and STD 300 lb. American flange valves 1" to 2".

CHATTERLESS

Photo shows Fulflo
Valve on a big
locomotive Diesel

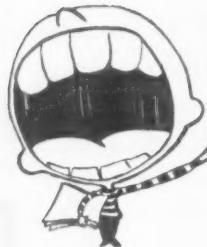


THE



**WRITE on your letterhead for copy of
FULFLO MECHANICAL DATA BOOK**

**Specialties Co., Inc.
BLANCHESTER, OHIO**



NEWS OF THE INDUSTRY

Morton Machine Works Occupies New Plant

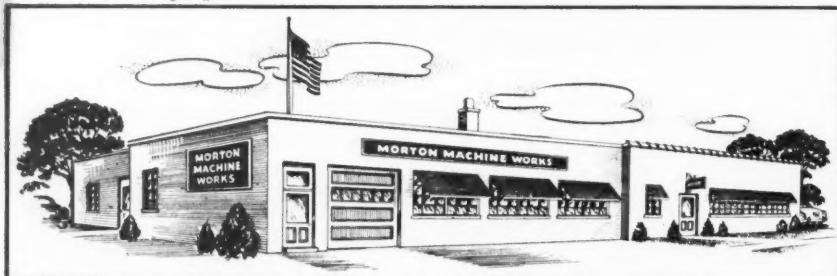
Morton Machine Works has recently moved to a new plant located at 2421 Wolcott St., Ferndale, Mich. The new plant is completely modern, with up-to-the-minute equipment, plus an efficient production line.

This move marks the third expansion by the company as a result of the steady increase in sales and steady growth of the organization. The company began modestly in a small Ferndale building with a floor space of only 456 square feet where fixture clamps and components were manufactured. As the sales of the firm increased, it was decided to expand facilities in order to expedite deliveries and better serve customers. Further increase in the firm's business necessitated the latest expansion to the new modern plant on Wolcott Street.

Simonds Abrasive Increases Grinding Wheel Production Facilities

A program of new production facilities for the manufacture of vitrified and resinoid bonded grinding wheels has been approved by the National Production Authority for the Simonds Abrasive Co., Philadelphia, Pennsylvania.

The project includes an additional continuous gear installation, with building to house it, for the production of vitrified bonded products and a new, additional complete production line set-up for the manufacture of resinoid bonded wheels. Also included in the project are extensive air conditioning, electrical wiring, and materials handling equipment installations. Substantial installation and construction work is currently in process in anticipation of early completion.



Architectural sketch of new plant of Morton Machine Works, Ferndale, Michigan

A better Lathe from any angle.



By whatever standards you measure a lathe—bearings¹, capacity², gearing³, apron⁴, bed⁵, power to spindle⁶, accuracy⁷—whatever is important to you, you will find it completely satisfied in a SHELDON lathe.

(1) "Zero Precision" Tapered Roller Bearings—the best Timken[®] on any lathe. (2) Large collet capacity with choice of Center Distance or Hobcut gears throughout for smooth operation. (3) Modern full double-wall apron. (4) Bed has an engineered backbone. (5) Two V-belts to spindle for greater pulling power. (6) Holds precise accuracy for years.



SHELDON

CHICAGO

SHELDON MACHINE CO., Inc., 4250 North Knox Ave., Chicago 41, Ill.

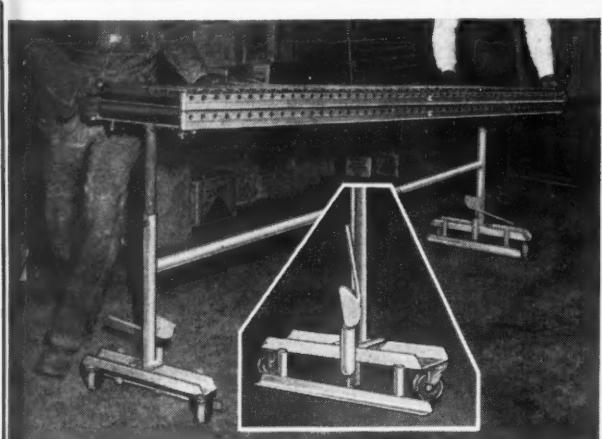
Quality Control Course

An intensive 10-day course in "Quality Control by Statistical Methods" has been announced by Dean F. M. Dawson of the College of Engineering and chairman of the committee on quality control at the State University of Iowa. The course will be given October 23 to November 2, 1951, inclusive at Iowa City, Iowa. This is the 9th course offered by the State University of Iowa. Representatives of industry from 29

states and officers and employees of the Armed Forces from New York to Oregon and from Minnesota to Texas have attended the previous courses.

The course is designed for persons in a supervisory or other position where the knowledge gained can be applied immediately. It is said to be particularly valuable to quality control supervisors, managers, industrial engineers, production engineers, designing engineers, persons specifying manufacturing

limits, individuals in charge of specifications for materials, and persons responsible for incoming materials. The fee for the course, including books and supplies, is \$100.00. Trainees will be expected to provide for their own living expenses and transportation to and from Iowa City. Those desiring to submit nominations for themselves or for representatives of their own organization to attend the course or those interested in obtaining any additional details should write to Professor Lloyd A. Knowler, Department of Mathematics, State University of Iowa, Iowa City, Iowa.



PORTABLE WHEEL and ROLLER GRAVITY CONVEYORS

Save Money on Your Handling Jobs

Standard 5' and 10' sections and 45° and 90° curves on portable tripod stands or portable section stands (as illustrated) with or without "Pelican" Floor Lock (See insert). Ideal for warehousing, loading and production line use. Easy to handle and move.

ASK FOR FOLDER 1251

POWER UNITS

Belt type Horizontal
and Floor-to-Floor
"Power Helpers"
Live Roller
CONVEYORS



METZGAR CO.

466 Douglas St., N. W.

GRAND RAPIDS 4, MICH.



The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

..... With the New PROCUNIER High Speed Tapping Head

Industry has long appreciated the many exclusive features and advantages found only in Procunier Tapping Machines. Precision built for faster, more accurate tapping, they have consistently proven their superiority on high-speed production runs. For more than 30 years they have been giving the tapping industry dependable service, insuring cleaner, sharper threads—with fewer broken taps, fewer spoiled pieces.

HERE'S WHY:

1. Tap breakage is practically eliminated due to high sensitivity of the new Procunier cork-faced friction clutch which automatically regulates driving pressure. Dull taps require more driving power than sharp ones . . . thus, even "green" operators can quickly detect dull or loaded taps by the "feel" or pressure on the clutch—thereby avoiding needless tap breakage.
2. Strain and wear are minimized and torsion eliminated thru special gear reversing mechanism which distributes pull thru three intermediate gears.
3. Chuck spindle is supported at both ends assuring true operation—avoiding tap wobble.
4. Aluminum housings assure greater strength and rigidity with minimum weight—a vital factor for high speed tapping. PLUS many other exclusive features.

WRITE TODAY

for full details and specifications on the complete line of Procunier Tapping Machines and see why Procunier offers the "finest in tapping equipment."

Procunier
Safety Chuck Company
12 S. CLINTON ST. CHICAGO 6

Procunier Safety Chuck Co., Dept. 10,
12 S. Clinton St., Chicago 6, Ill.

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

Name.....

Address.....

City..... Zone.... State.....

William H. Nichols

William H. Nichols, prominent Waltham industrialist, inventor, and president of W. H. Nichols Company, the firm he founded 50 years ago, died recently two days after his 78th birthday. Noted as a pioneer inventor in New England, Mr. Nichols invented the Zenith Rayon Pump, the Geroter Pump, and the Nichols Hand Miller. He under-

took his first business venture at 16, the operation of a bicycle building and repair shop. He later won fame as a bicycle racer, establishing the world's record for the quarter-mile sprint.



William H. Nichols

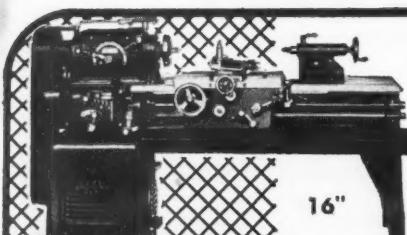
Mr. Nichols served his apprenticeship as a toolmaker at the Pratt & Whitney plant, later working at the Stanley Works, the Veede Corporation, and the American Watch Tool Company. His first real shop was started in the basement of his home in 1902 and, after several moves and expansions, he established the present shop at 48 Woerd Avenue, Waltham, Massachusetts. During World War I, the plant turned out much essential war material for the famous Liberty airplane engine. In World War II, his firm was awarded five Army-Navy "E" awards for excellence in quality and production on many types of intricate parts for aircraft equipment. Mr. Nichols was also the recipient of the National Association of Manufacturers' "Pioneer Award" as one of 26 pioneer inventors in the New England States.

XPEDITORS
GUARANTEED TO
SAVE YOU TIME
* on clean up job
* production
* in semi-automatic
machines

The XPEDITOR is the latest development in portable, high speed abrasive belt grinders. Instantly adjustable to any angle to give operators full view and control . . . swivels 360°. Equipped to do line contact, free belt and precision platen grinding and contour polishing. Speeds deburring and clean-up jobs; also used with jigs or fixtures or automatic feeding as a production unit . . . guaranteed to increase productivity. Write for bulletin.



HESTON & ANDERSON KIRKWOOD STREET FAIRFIELD, IOWA



THE CARROLL & JAMIESON MACHINE TOOL CO.

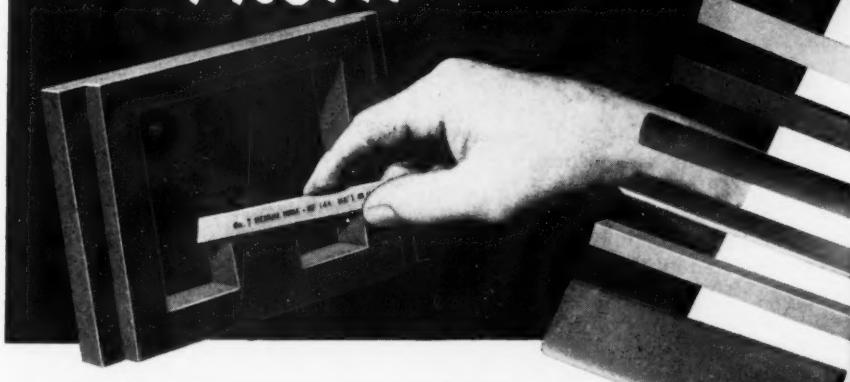
SATAVIA,
OHIO, U.S.A.

CARROLL AND JAMIESON LATHES

- This 16" lathe is equipped with 12 speed geared head, motor drive, and Timken mounted spindle. It's modern in design — with liberal dimensions.

Write today for descriptive bulletin.

PRECISION at the start MEANS PROFIT ALL THE WAY



INDIA® and HARD ARKANSAS

Oilstone Files of

NORTON® abrasives

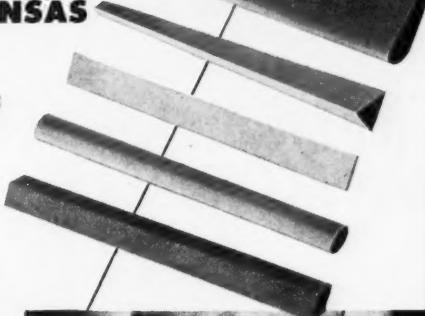
THE FINAL STONING on a die may spell all the difference between a production job that's a headache—or a source of solid profit. In the trained hand of the diemaker, these NORTON Abrasive oilstone files are a true precision tool, fabricated to produce the initial accuracy that is reproduced in volume in the ultimate product. NORTON Abrasive electric-furnace INDIA and natural HARD ARKANSAS are available in a complete line of files, slips and bench stones.

IN PRODUCTION TOO . . .

These oilstone files are widely used for deburring, rounding edges, etc., on production work.

They're also ideal for keen long-lasting edges on cutting tools.

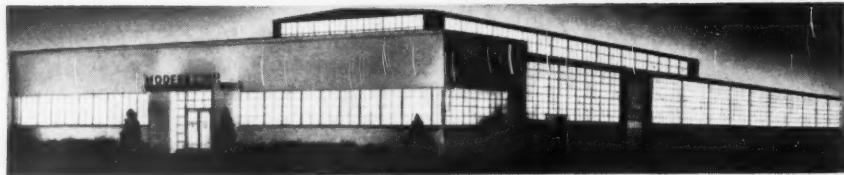
Get your free copy of the Norton Abrasives "OILSTONE FILES" folder for handy reference. Request it today from Dept. MS-10.



BEHR-MANNING • TROY, N. Y.

COATED ABRASIVES • SHARPENING STONES • PRESSURE-SENSITIVE TAPES

EXPORT: BEHR-MANNING OVERSEAS INC., NEW ROCHELLE, N. Y., U.S.A. • CANADA: BEHR-MANNING CANADA (LTD.) BRANTFORD, ONT.



Plant of Modern Corp., Oak Park, Michigan

Plant Expansion Program Recently Completed by Modern Corporation

A plant expansion program doubling the amount of available floor space has been completed by Modern Corp., Coolidge Highway, Oak Park, Mich. According to Don MacPetrue, plant manager, the expansion gives Modco one of the largest areas in the country devoted to the manufacture of special cutting tools. In addition, footings have al-

ready been poured and steel is being erected for a second plant expansion which will add 10,000 square feet more to Modco's facilities.

In line with the expansion program, over a quarter of a million dollars worth of new machines have been purchased and are being installed. Plant layout is planned for in-line work flow in order to apply the economies of mass production to the manufacture of special metal cutting tools.

**for greater RIGIDITY
more ACCURATE cuts**

use
CRITERION
BORING HEADS



CRITERION
machine
WORKS

A full line of adjustable boring heads and bars now available. Heads 1½" to 7" dia. Carbide or high speed bars $\frac{3}{8}$ " to $1\frac{1}{4}$ " dia. Lead screws ground AFTER HARDENING. Ample bearing surface, heat treated parts, interchangeable shanks. Criterion tools are the criterion. Write for free catalog and costs.

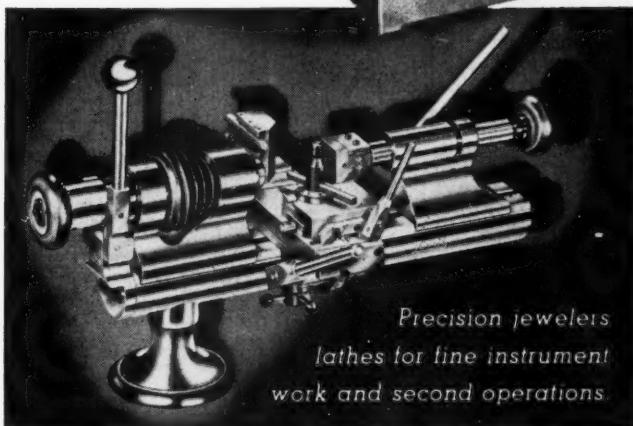
9312 SANTA MONICA BLVD. • BEVERLY HILLS, CALIF.

LEVIN TOOLS ARE DESIGNED TO MAKE DELICATE PRECISION EASIER

MICRO-DRILL PRESS

The Levin Micro-Drill Press is designed to hold small drills in precision collets, thus overcoming the difficulty of getting a drill to run true as when held in a conventional drill chuck. The absence of a sliding quill guarantees maximum sensitivity with fingertip control. A mounted $\frac{1}{8}$ " capacity drill chuck can also be used. WRITE FOR BULLETIN H DESCRIBING THE MICRO-DRILL PRESS and listing collet sizes.

*for drilling holes
as small as .002"*



*Precision jewelers
lathes for fine instrument
work and second operations.*

**SEND FOR
CATALOG E
DESCRIBING
LATHES AND
ACCESSORIES**

COMPLETE CATALOG illustrates and describes full line of accessories . . . compound slide rests, grinding, milling and screw cutting attachments, cross slide, collet closer and other useful items

LOUIS LEVIN & SON INC., 782 E. PICO BLVD., LOS ANGELES

T. R. Jones to Receive 1951 Gantt Management Medal

Thomas Roy Jones, president of Daystrom, Inc., Elizabeth, N. J., has been designated the 1951 winner of the Henry Laurence Gantt medal for "distinguished achievement in industrial management as a service to the community," according to an announcement made by The American Society of Mechanical Engineers. Presentation of the

award, given annually to an outstanding American industrialist, will be made November 28 at the society's 72nd annual meeting at Atlantic City, New Jersey.



Thomas Roy Jones

Recent previous winners of the medal have included Paul G. Hoffman, John Hancock, Alvin E. Dodd, Fowler McCormick, Arthur C. Spurr, and Charles R. Hook. The Gantt medal was established in 1929 in honor of the late Henry Laurence Gantt, management engineer and industrial leader. Awarded jointly by the A.S.M.E. and the American Management Association, it is recognized as industry's top award for achievement in industrial management service to the community.

Mr. Jones is widely known throughout the country for his efforts in committee and public service in the field of employee communications. In recent years he has devoted much thinking and study to gaining a better understanding of the science of human relations as they affect industrial employees and the public as well. He has



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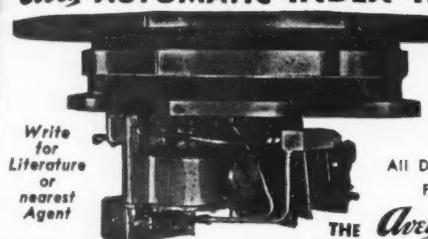
This new, streamlined bench type grinder, assures fast, quality finishing on metals, plastics, wood, fibre...at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x3 $\frac{1}{4}$ " band. The ideal portable unit.

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THE **Avey** Drilling Machine Co., Cincinnati 1, Ohio

personally been responsible for the development of many techniques of employer-employee relations that have been adopted by other progressive companies. Prior to the presidency of the American Type Founders and now Daystrom, Incorporated, Mr. Jones had been assistant general manager of The Cincinnati Milling Machine Company and vice president and general manager of Harris-Seybold-Potter Company.

Herman M. Koelliker

Herman M. Koelliker, vice president of Chicago Rawhide Mfg. Co., Chicago, Ill., died recently of a heart attack at the age of 59. Mr. Koelliker was a graduate of Case Institute of Technology in the class of 1914. Prior to coming to Chicago Rawhide he was vice president and general manager of Ohio Rubber Co., Willoughby, Ohio, and vice president and director of Baldwin Rubber Company at Pontiac, Michigan. His earlier experience included work with the following companies: Grasselli Chemical Company, U. S. Rubber Company, Buckeye Rubber Company, and Tucker Rubber Company.

Mr. Koelliker joined the staff of Chicago Rawhide in 1936 for the purpose of pioneering and developing the use of molded synthetic rubber products as

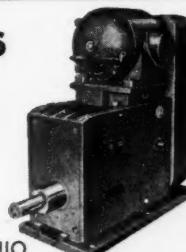
precision machine parts, particularly for difficult and critical applications. Under his management the Sirvene Division of the company has grown from a small technical staff in 1936 to a technical and manufacturing division employing more than a thousand people. He became a vice president of Chicago Rawhide Manufacturing Company in 1942.

WESTLEN Adjustable Self Centering REELS

For feeding strip and wire coil stock to presses. Coil capacity 300 to 500 lbs. Outside ring dia., 28" to 36". Height of reel, 36". Wheel automatically adjusts parts to suit inside diameter of coils from 11" to 20". Arm allows for quick conversion to horizontal or vertical position and adjusts height of reel.

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Alloy steel is cold worked to form a continuous compact structure. In addition much closer tolerances are maintained.

Better service to dealer and user results from the high productivity of Brighton's processes.

Ask for Brighton Socket Screws from your industrial distributor. Write for new catalog.

Whitney Chain Company Assigns Woodruff Key Division to Standard Steel Specialty Company

The Whitney Chain Co., Hartford, Conn., has announced the transferal of its Woodruff Key Division to Standard Steel Specialty Company. This assignment includes the good will, manufacturing equipment, and stock inventory of this division.

The Woodruff system of keying was introduced to industry by the Whitney Chain Company in 1896. The company has stated that transferal was made necessary due to the need for utilizing complete plant capacity for production of power transmission and conveying chain products. In keeping with this move, Standard Steel Specialty Company has established additional service facilities through a plant addition at Hammond, Indiana. Woodruff keys will be produced and shipped from the Hammond plant, in addition to the Beaver Falls, Pennsylvania plant where production and service facilities are maintained.

DoAll Establishes Cutting Tool Division

In recent months, The DoAll Co., Des Plaines, Ill., has expanded its regular line of band machines and gage blocks to include a complete new line of cutting tools, gage blocks, and accessories and industrial supplies. In conjunction with this program of expansion, a new Cutting Tool Division has been established. Bernard E. Aldridge has been appointed sales manager of the new division and will be responsible for coordinating this new expanded line of products throughout DoAll's own network of sales-service

IT'S ACORN BANDED THRUST BEARINGS



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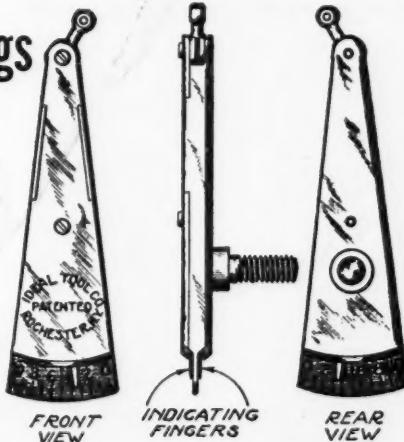
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(Left to right) Bernard E. Aldridge, Paul Janesch, and Robert Douglas

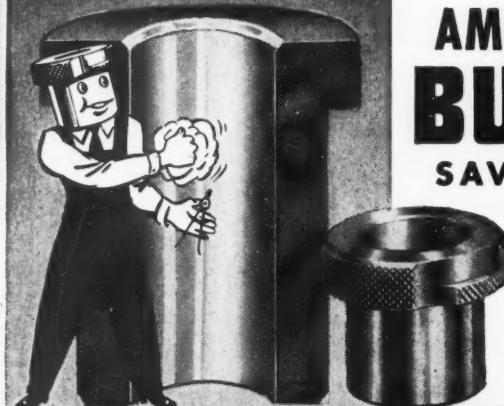


stores. Mr. Aldridge has been active in the cutting tool field as a production man, sales-service engineer, and manager of a cutting tool supply business.

Paul Janesch has been appointed assistant sales manager of the Cutting Tool Division and will be responsible for correlating the training of the cutting tool specialists, promotional aids, and inventory controls maintained throughout the company's various sales-service stores. Mr. Janesch was formerly with Avildsen Tools and Machines, Incorporated, as district sales manager.

Robert Douglas has been appointed executive buyer for DoAll's expanded line of industrial products and will be in charge of purchasing all cutting tools, gages, and industrial supplies which are now distributed by trained specialists operating from the company's sales-service stores. Mr. Douglas has had over 18 years of experience in purchasing and sales in various mill and industrial supply houses and General Motors and U. S. Steel subsidiaries.

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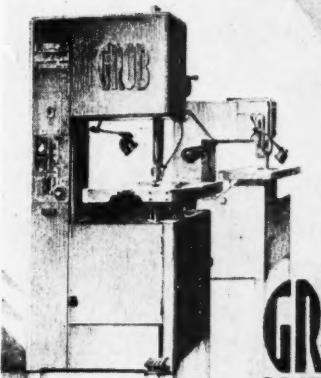
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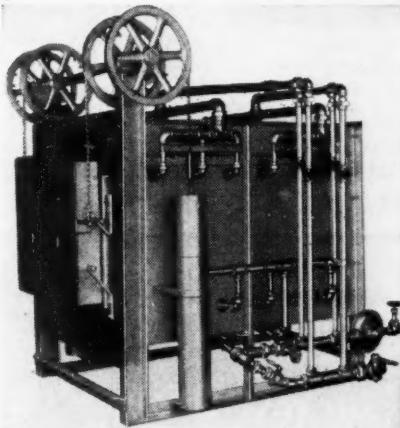
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This AGF Model No. 232-C Oven Furnace is only one of a complete line of furnaces of all gas types.

A liberal supply of burners, superior insulation and venting, along with super engineering and construction insure your investment when you buy AGF equipment.

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MODERN MACHINE SHOP 329

Harris Elected Engineering Vice President for Micromatic Hone

Kirke W. Conner, president of Micromatic Hone Corp., Detroit, Mich., has



William H. Harris, Jr.
contributed articles for various technical publications.

A graduate of Michigan College of Mining and Technology and a member

announced that William H. Harris, Jr., was elected vice president in charge of engineering at a recent meeting of the board of directors. Mr. Harris was previously chief engineer and, besides holding several honing patents, has

of the Society of Automotive Engineers and Engineering Society of Detroit, Mr. Harris has been with Micromatic Hone Corporation for 16 years.

American Cyanamid Executives Elected to New Posts

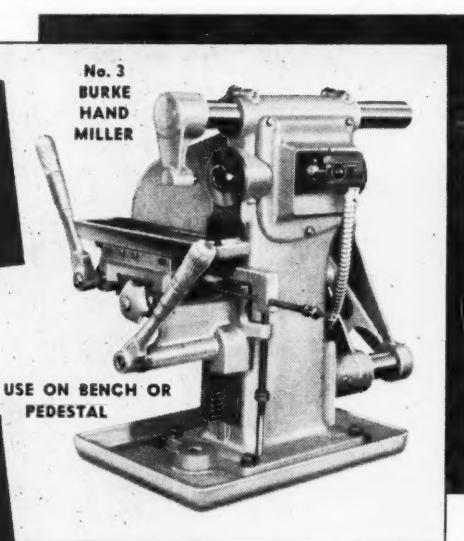
The election to new posts of several executives of the American Cyanamid Co., New York 20, N. Y., has been announced by Raymond C. Gaugler, president. E. D. Powers, vice president in charge of production, has been elected to the board of directors, succeeding H. P. Eastman who retired recently. A. J. Campbell, general manager of the Industrial Chemicals Division, and Howard Huston, formerly assistant to the president, have been elected vice presidents. L. C. Duncan has been named assistant to the president.

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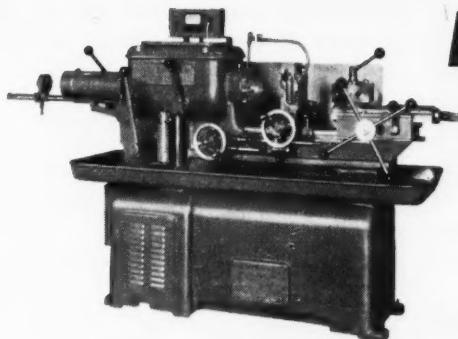
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Plain or Back-Geared — Forged steel spindle with anti-friction precision bearings, friction clutch and brake. Spindle nose, $2\frac{3}{8}''$ -8.

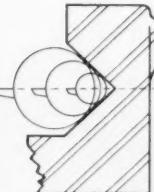
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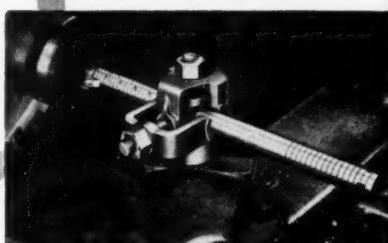
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MACHINE TOOL DIVISION

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Other executive changes include the election of J. J. Murray and G. C. Walker as assistant treasurers and J. W. King and W. B. Ward as assistant comptrollers.

Norton to Increase Facilities for Manufacture of Silicon Carbide Grain

Plans to provide increased facilities for the manufacture of "Crystolon"

silicon carbide grain have been announced by the Norton Co., Worcester 6, Mass. Basically, the plans call for a re-equipping of two of the present abrasive mills in the Worcester plant. By combining the crushing and milling units now housed in these two mills, Norton's processing of silicon carbide grain, it is claimed, will be increased 30 per cent.

The new unit will be known as Abrasive 7. Conversion is now underway, with full production in the re-equipped area expected late this year. Initial cost of the project is estimated at \$750,000. Much of the new equipment for Abrasive 7 will replace that formerly used in the manufacture of grinding wheels. As part of the new Abrasive 7 project, large storage bins will be constructed which are expected to double Norton's storage capacity of Crystolon abrasive grain in Worcester after it comes from the company's electric plants which are located at Chippawa, Ontario, and Cap-de-la-Madeleine, Quebec.

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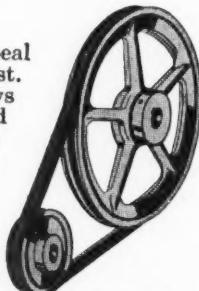
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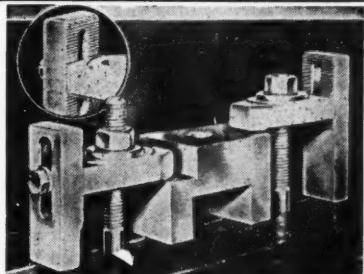


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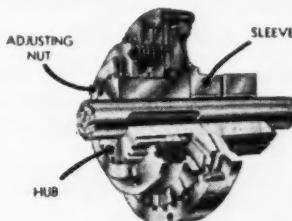
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Engineering Awards Made by Lincoln Arc Welding Foundation

Engineering honors and cash awards totaling \$5,000 have been given by the Lincoln Arc Welding Foundation of Cleveland, Ohio, to 63 young engineers in 28 different states, representing 34 different engineering schools. Funds totaling \$1,750 were also awarded to three engineering schools to establish scholarships in honor of and named for

the engineers receiving the main awards.

The awards were made in the fourth annual competition of the foundation's Engineering Undergraduate Award and Scholarship Program. The program offers awards for papers by engineering undergraduates on the design, fabrication, research, or maintenance of machines or structures in which arc welding is used. The foundation is sponsoring a 10-year series of programs to encourage undergraduate engineers to use imagination and ingenuity in developing engineering projects.

In honor of Hugh M. Rush, who received the first award of \$1,105.03, Purdue University will receive \$1,000 to establish four scholarships in the Department of Mechanical Engineering in which Mr. Rush was enrolled when he prepared his award paper, "Hydraulic Cranes for Military Vehicles." For his paper, "A Comparison of Riveted and Welded Design on a Through Plate Girder Railroad Bridge," Walter H. Halstead re-

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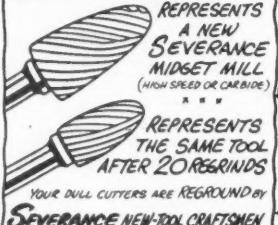
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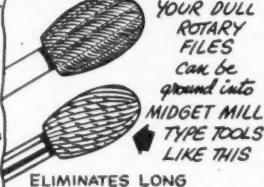
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YOUR DULL ROTARY FILES can be ground into
MIDGET MILL TYPE TOOLS LIKE THIS
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COOLING ANTI-FRICTION COMPOUND

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COOLS
HOT
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WEAR
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PARTS

Find out how Motor Mica can put an end to your lubricating problems. Try it with your cutting oils, in die-casting, deep-drawing, metal stamping, etc. Write on your business letterhead for free sample. No obligation.

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I M M U N O L

Neutral, non-inflammable, odorless and non-toxic IMMUNOL added to any water will immunize that water against causing rust and at the same time makes a powerful detergent and wetting agent. Parts treated are protected by a clean, non-oily, invisible film.

* Add a small quantity of IMMUNOL to one of two jars containing plain water. Put a screw in each of the jars. Observe them after a day or a week. One screw will be rusted, the other in the IMMUNOL solution will be bright and clean.

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ceived the second award of \$552.50 and Lafayette College received \$500 to establish two scholarships in the Department of Civil Engineering in his honor. The third award of \$276.25 was made to Paul E. Potter for his paper, "An All Welded Steel Bridge," and in his honor Oregon State College received \$250 for a scholarship in the Department of Civil Engineering.

Dates for the next annual competition have been announced by the Foun-

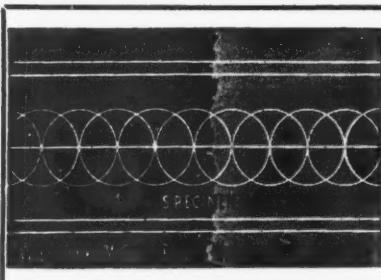
dation as June 1, 1951 to May 31, 1952. All engineering undergraduates are eligible to participate while they are registered as an undergraduate. Rules are available from The James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio.

Pivot Punch and Die Expands Plant

Robert H. King, president of the Pivot Punch & Die Corp., North Tonawanda, N. Y., has announced that a 20 per cent increase in factory space has been required due to increased orders resulting from the company's recent inauguration of a service which offers more than 276 million punch sizes and styles. This increase in punch orders, together with greatly increased defense orders for dies, jigs, fixtures, and special machines, has kept two shifts of employees busy at the plant. Even further expansion plans are already at the drawing board stage.

Construction of New Plant Announced by Fairfield Manufacturing Company

Construction of a new \$2,500,000 plant has been announced by Fairfield Mfg. Co., Lafayette, Ind., maker of gears and differentials. Already start-



DYKEM STEEL BLUE

Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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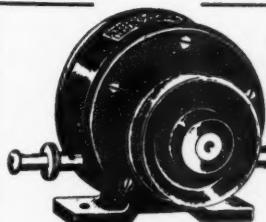
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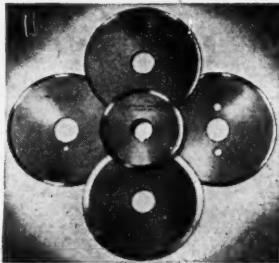


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BLOW TORCHES

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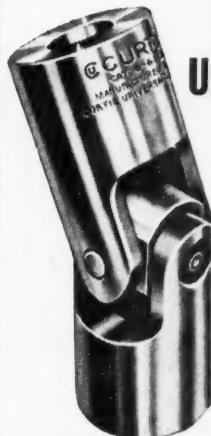
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Discs 7" dia., $\frac{3}{8}$ ", $\frac{1}{2}$ ", and $\frac{5}{8}$ " thick carried in stock.
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CURTIS UNIVERSAL JOINTS



the only
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Simplicity

Fewer parts, simpler construction, make assembly and disassembly easy. Greater strength saves weight, space, material.

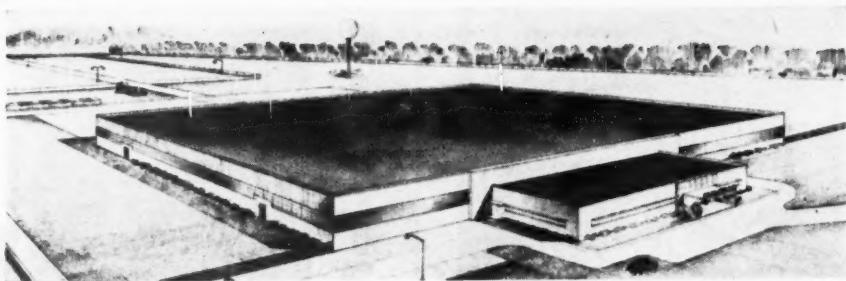
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Architect's drawing of new plant of Fairfield Mfg. Co., Lafayette, Indiana

ed, the new plant is expected to be ready for occupancy before the end of 1951. The new structure will provide Fairfield with 181,000 square feet of floor space to house office, engineering, and manufacturing departments.

Founded in 1919 to specialize in the production of automotive type gears, the company has undergone repeated

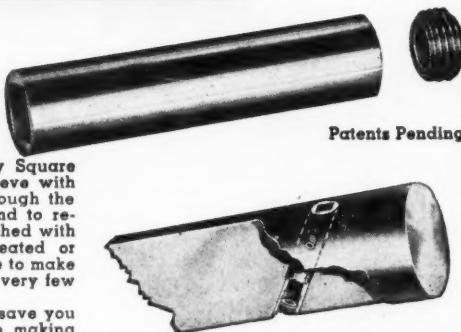
expansion to a point where it is now one of the country's largest contract manufacturers of gears for trucks, tractors, buses, agricultural implements, construction machinery, machine tools, and other equipment. Construction of the new plant will provide improved working facilities, as well as increased production capacity.

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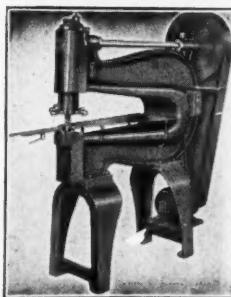
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Steel Executive to Receive Metal Trades Award

Hugh L. Bills, vice president in charge of industrial relations of the Acme Steel Co., Chicago, Ill., will receive the coveted Annual Industrial Relations Achievement Award of the National Metal Trades Association at the association's 52nd annual convention to be held at the Blackstone Hotel in Chicago, November 14, 15, and 16. Inaugurated at the association's Gold-

en Anniversary in 1949, the award, in the form of an inscribed plaque, recognizes the American citizen whose contributions in the field of industrial relations are deemed most important. The two previous awards were won by Louis Ruthenburg, chairman of the board of Servel, Inc., in 1949 and Harold S. Falk, president of the Falk Corp., Milwaukee, Wis., in 1950.

Mr. Bills was for 16 years a labor relations consultant and vice president of

one of the leading management engineering organizations. He came to Acme Steel in 1937 as director of industrial relations. As director, he was instrumental in the establishment of the Industrial Relations Department at Acme and was active in expanding the facilities and services of that department to become a vital link in employer-employee relationships. He was made vice president in charge of industrial relations of Acme Steel in January 1950.

The plaque recognizing Mr. Bills' achievements will be presented to him by Jos. L. Kopf, the National Metal

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Trades Association's president, at a special luncheon ceremony held on August 29, 1951.

Donald Goodwill Appointed Chief Engineer of Lees-Bradner

John A. Bradner, president of The Lees-Bradner Co., Cleveland 11, Ohio, manufacturer of gear hobbing and threading machinery, has announced

the appointment of Donald Goodwill to the post of chief engineer. Starting his career with Lees-Bradner in 1934, Mr. Goodwill has served the company as assistant chief engineer since 1940. Born in London, England, he was educated at Battersea Polytechnic and subsequently graduated from Fenn College with a B.S. degree in mechanical engineering.



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Simonski Company Moves to Own Quarters

The Gilbert S. Simonski Company, maker of Lucifer electric furnaces and formerly located at 401 North Broad Street, Philadelphia, has moved to its own modern brick building on Easton Pike (Route No. 611) in Neshaminy, Bucks County, Pennsylvania. The structure is of one-story fireproof construction.

Following the recent, untimely death of Gilbert S. Simonski, founder of the business, Anthony Lipsi, Mr. Simonski's long time associate and production manager, has been appointed general manager of the firm.

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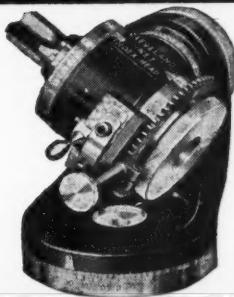
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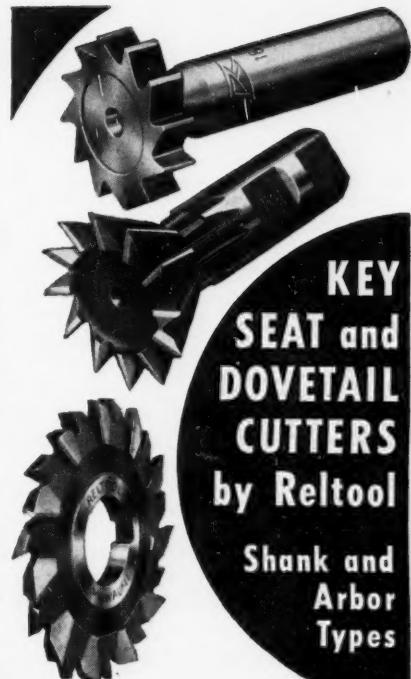
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DOVETAIL
CUTTERS
by Reltool
Shank and
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Types

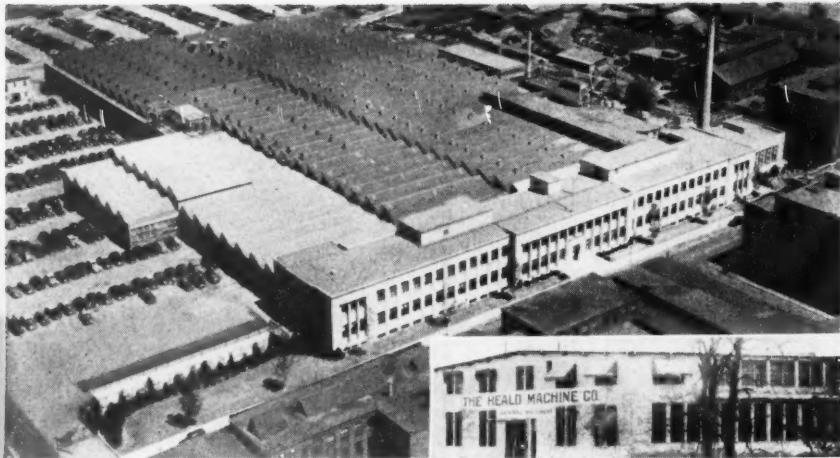
• Woodruff Key Seat Cutters by Reltool are furnished in both Shank and Arbor Types. Right Hand Cut, shank type, carried in stock; Left Hand Cut, special. Arbor Type Keyseat Cutters have staggered teeth, with side teeth relieved for narrow margin.

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Airplane view of present plant of Heald Machine Co., Worcester, Mass. Inset: View of old Heald shop taken in 1903.

Heald Machine Company Observes 125th Anniversary

The year 1951 marks the 125th anniversary of continuous operation by The Heald Machine Co., Worcester 6, Mass., manufacturer of boring and grinding machines. Since 1826 when Stephen Heald, the great grandfather of Roger, Richard and Robert Heald, the present management, started the little business in Barre, Mass., the company has been building machines and equipment to meet the needs of the times.

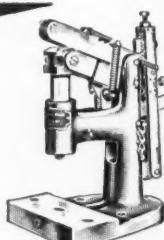
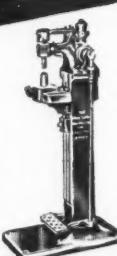
To commemorate this 125th anniversary, the company scheduled appro-

priate activities, including an open house period for the Heald employees and local business associates and friends, which was held from September 10 to 13. In addition, Heald has issued a 32-page booklet covering the history of the company from its inception in 1826 to the present day. Besides numerous illustrations depicting the progress of the company over the past 125 years, the booklet also contains pictures showing the complete line of boring and internal and rotary surface grinding machines currently being offered by Heald.

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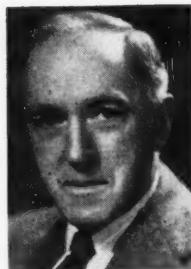
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Cleveland Punch & Shear Works Honors 50-Year Employee

The Cleveland Punch & Shear Works Co., Cleveland 14, Ohio, recently held a special assembly of all personnel to honor the first worker to spend 50 years with the company. The worker thus honored was Harvey J. Corrin, vice president, who in 1901 joined the Cleveland organization at the age of 16 as a junior office boy. During the following

years, Mr. Corrin progressed through the cost and sales departments, becoming sales manager in 1918 and vice president in 1941.



Harvey J. Corrin

In recognition of his 50 years of service, Mrs. Florence M. Sayle, president, presented him with an all-expenses-paid vacation to Mexico and two handsome traveling cases. Later, in a humorous vein, the next two oldest employees in service—Fred Gogolin, foreman in the small tool division, with 45 years of service, and Fred Nachtigal, patternmaker, with 44 years of service—presented Mr. Corrin with colorful Mexican apparel for his trip.

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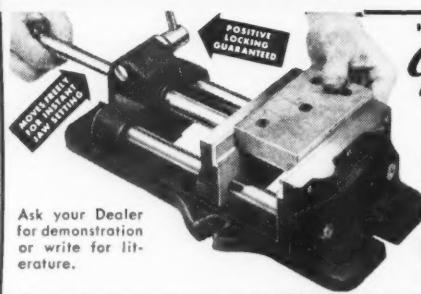
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In order to expand its service to customers in the State of Michigan, Pratt & Whitney of West Hartford, Connecticut, has relocated its Detroit office in a new, modern building located at 8626 West McNichols Road, Detroit 21, Michigan. The additional space provided at the new location permits Pratt



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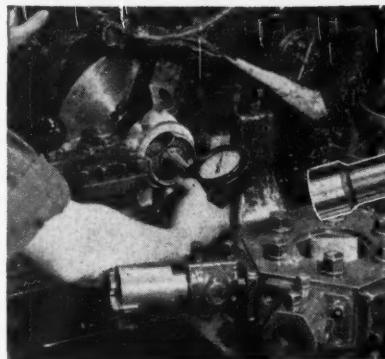
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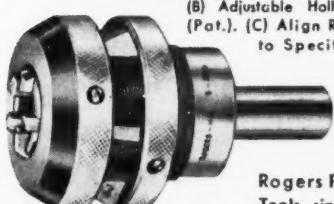
For data on COMTORGAGE Precision External Gage, request Bulletin 30.

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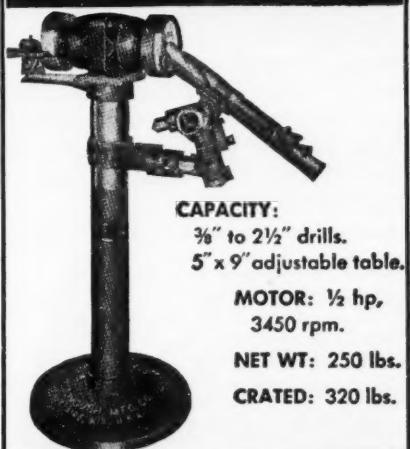
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Two New Members Added to Gisholt 50-Year Club

The six men shown in the accompanying illustration have each put in

over 50 years of continuous service with the Gisholt Machine Co., Madison 10, Wis., manufacturer of turret lathes, automatic lathes, balancing machines, super-finishers, and special machines. The occasion for the photograph was the "initiation" of two new "youngsters" into the active membership of the 50-Year Club.

The two new members are shown seated in the front row holding the gold commemorative watches which were presented to them upon their entrance into the 50-Year Club. Pictured from left to right in the front row are Al Tandvig (Standards Dept.), Ed Sorenson (Planning Dept.), and August Gerfen (Engineering Dept.). Shown from left to right in the back row are Dave Wright (traffic manager), John Nebel (Milwaukee representative), and George Gernon (secretary of Gisholt Machine Company).

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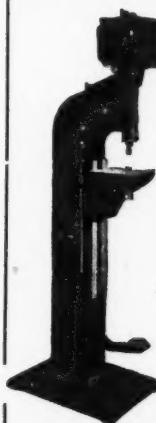


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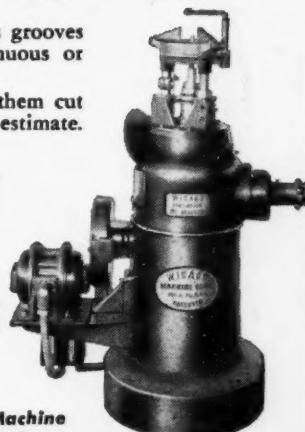
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Precision Internal Grinder — Screw Machine Products.



Machine Tool Industry Advisory Committee

The National Production Authority, U. S. Department of Commerce, has announced the membership list of the Machine Tool Industry Advisory Committee, as follows: W. W. Barton, president, W. F. & John Barnes Co., Rockford, Ill.; L. C. Edgar, Jr., president, E. W. Bliss Co., Canton, Ohio; Swan Bergstrom, vice president, Cincinnati Milling & Grinding Machine,

Inc., Cincinnati, Ohio; A. G. Bryant, vice president, Cleereman Machine Tool Co., 400 W. Madison St., Chicago, Ill.; Arthur H. Ingel, president, Consolidated Machine Tool Corp., Rochester, N. Y.; F. C. Andrews, vice president, Economy Engineering Co., Willoughby, Ohio; D. A. Currie, president, Erie Foundry Co., Erie, Pa.; E. W. Miller, president, Fellows Gear Shaper Co., Springfield, Vt.; Ralph J. Kraut, president, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.; Harvey Goldman, Harvey Goldman Co., 9656 French St., Detroit, Mich.; John C. Cotner, president, The Hydraulic Press Mfg. Co., Mount Gilead, Ohio; M. A. Hollengreen, president, Landis Tool Co., Waynesboro, Pa.; Richard E. LeBlond, president, R. K. LeBlond Machine Tool Co., Cincinnati, Ohio; Wm. B. Henry, president, Mitts & Merrill Co., Saginaw, Mich.; Jerome A. Raterman, president, The Monarch Machine Tool Co., Sidney, Ohio; Thomas R. Rudel, president, Rudel Machinery Co., 100 E. 42nd St., New York, N. Y.; R. E.

STOP making your own punches

WE'LL MAKE ANY PUNCH AT A PRICE BELOW YOUR OWN COST!

Pivot punch

Decision punches

for
EVERY
PURPOSE
from
ONE
dependable
SOURCE

More than 716,000,000 standard sizes and types at standard catalog prices. No hidden prices for "In-Between" sizes.

No Need to Stop to Standardize. 276,000,000 sizes and styles at standard catalog prices. No hidden prices for "In-Between" sizes.

Any Type of Punch in a Choice of Four Qualities. A punch for every purpose — a punch for every cost at prices below your own cost to manufacture.

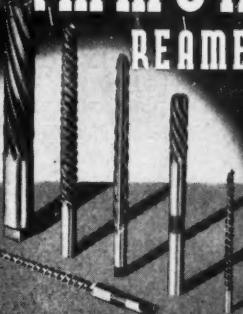
SEND FOR NEW FREE CATALOG. WRITE DEPT. 3.

ONE SOURCE FOR ALL OF YOUR PUNCHES

pivot punch

DIVISION OF PIVOT PUNCH AND DIE CORPORATION

GAMMONS REAMERS



Manufacturers of

The Gammons Helical Taper Pin Reamer
The Gammons Helical Checking Reamer
The Gammons Helical Die Makers Reamer
The Gammons Duplex Taper Pin Reamer

Special reaming problems invited

Send for Catalog

THE GAMMONS-HOAGLUND CO.
MANCHESTER CONNECTICUT

"Get them from Gillen"



TAPER PINS
MACHINE KEYS
SPECIAL MACHINE PARTS
WOODRUFF KEYS
GROOVE PINS

Write for Catalog
and Prices

John Gillen Company
INC.
2642 SOUTH 50th AVENUE • CICERO 50, ILLINOIS

M.Z.B. Mauser Type PRECISION VERNIER CALIPERS

*The most popular PRECISION
MEASURING TOOL the world over*

- For measuring outside, inside and depth
- Measuring capacity 5 1/4"
- Each caliper has two accurately divided scales and verniers to read
 - (A) Decimals to .001" and 1/20 m/m (Cat. #30-64)
 - (B) " ".001" and 1/128" (Cat. #30-61)
- Full visibility of scales in all positions
- Clear cut markings
- In most cases no magnifying glass needed
- Special chrome steel, spring tempered, glass hard on measuring surfaces
- Setting remains fixed and will not shift when pressure on lock is released

Stainless steel and large sizes also available

WRITE DEPT. A

INTER-CONTINENTAL TRADING CORP.
90 WEST STREET, NEW YORK 6, N. Y.

\$14.
Postpaid



Frushour, president, South Bend Lathe Works, South Bend, Ind.; Frederick S. Blackall, president, Taft-Pierce Mfg. Co., Woonsocket, R. I.; James Y. Scott, president, Van Norman Co., Springfield, Mass.; L. D. McDonald, executive vice president, Warner & Swasey Co., Cleveland, Ohio.

National Conference on Industrial Hydraulics to Be Held in Chicago November 8 and 9

The seventh annual National Conference on Industrial Hydraulics will be held November 8 and 9 in the Sherman hotel under the sponsorship of the graduate school of Illinois Institute of Technology and Armour Research Foundation of Illinois Institute of Technology. The two-day meeting will be devoted to the presentation of technical papers by authoritative speakers on the latest developments in the industrial hydraulics field. The National Conference is a non-profit function.

MARKING TOOLS TO GIVE YOUR PRODUCT

The Mark of QUALITY!

TYPE HOLDERS AND STEEL TYPE



Parker precision press and hand marking type holders are engineered for quick, accurate interchangeability of type. This is furnished in all standard character sizes from $3/64"$ to $1/4"$ or in special type and symbols to your specifications.

MARKING DIE FOR AZIMUTH SCALE



Sharp, clean, raised 1° increments and a double row of perfect figures, from 10 to 170 in this semi-circular azimuth scale all hardened into a solid tool steel block. Parker dies cost less because they perform perfectly—longer.

STANDARD OR SPECIAL STAMPS



Parker steel trade mark, identification, part number or inspection stamps are made in dozens of standard shapes and designs. Special stamps in any quantity, any size to mark any material are also manufactured to your specifications.

REMOVABLE INSERT MARKING DIES



This removable segment die is used for stamping and coding military shell cases. Here one die replaces three used previously and eliminates two stamping operations, thereby decreasing marking cost by over 60%. Another application of Parker experience and craftsmanship.

SEND FOR THE PARKER
BLUE BOOK TODAY



INVESTIGATE THE FLEXIBILITY
OF PARKER'S FACILITIES TODAY!

THE

PARKER
STAMP WORKS, INC.

WORKING DIE & MACHINERY DIV.

FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

"THE ORIGINAL" MAUSER

MAUSER PRECISION VERNIER CALIPER

\$14.75 PPD

MONEY BACK GUARANTEE FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.

3 GRADUATIONS 1/1000" - 1/128" 1/10mm. IN BACK

NEW EXCLUSIVE CAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.

THE MAUSER TRADEMARK... IS YOUR PROTECTION.

GEO. SCHERR CO., INC. 198 ALFAYETTE ST., N.Y. 12, N.Y.

HARDENED and GROUND HSS BLANKS

Any decimal diameter to $\frac{1}{2}$ " — in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tool, etc. Quick delivery.

Write for price list D-2
WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N.J.

Over 85% of the torque wrenches used in industry are

Sturtevant TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

In inch ounces
...inch pounds
...foot pounds
(All sizes from
0-8000 ft. lbs.)



Every manufacturer,
design and production
man should have this valuable
data. Sent upon request.

P.A. Sturtevant Co.
Addison Quality Illinois

COOLEY HEAT TREATING FURNACES

ELECTRIC BOX TYPE • FLOOR AND BENCH MODELS

For Tools and Small Parts

SHOWN HERE



THE COOLEY BENCH MODEL RECIRCULATING AIR DRAW

Max. Temp.	Sizes	Price
1250°	10" x 6" x 14"	\$475

All prices are less controls. Any standard controls available for automatic temperature control.

1. IDEAL FOR

- aluminum and beryllium copper heat treating.
- closely controlled mild and high-speed steel tempering.

2. Stainless steel lined chamber.

- 3. Accommodates up to 50 lbs. of parts.
- 4. Holds temperature uniformity $+5^{\circ}$ — -0° F.
- 5. 4 kw. input at 230 v. assures rapid heating.

Brown and Wheelco Control Pyrometer carried in stock — available for all applications
Free on request: COMPLETE CATALOG "SHOP NOTES ON HEAT TREATING"

COOLEY

ELECTRIC MANUFACTURING CORP.
34 SO. SHELBY • INDIANAPOLIS, IND.

of Agricultural Engineers, Illinois Society of Professional Engineers, and the Western Society of Engineers.

Clearing Machine Corporation Purchases 100,000 Square Foot Plant in Hamilton, Ohio

Purchase of a factory building of approximately 100,000 square feet working area in Hamilton, Ohio, has been

announced by Clearing Machine Corporation, Chicago press manufacturer. The new plant, which was purchased complete with machinery and equipment from the Hamilton-Thomas Corporation, will be utilized immediately in expanding the production of the Chicago company to meet urgent defense requirements. A working force of some 250 people has been making Liberty planers and other machines in the plant, and the new owners will continue that business also, retaining the same workers and supervisors so far as practical.

With the purchase of the Hamilton property, the Clearing Machine Corporation has abandoned plans to erect a factory building on recently acquired land in Joliet. The newly purchased building is approximately three times as large as the structure contemplated for Joliet, but in acquiring it, Clearing has assumed responsibility for an additional backlog of orders for machines, many of which are also for defense requirements.

General management of the

LOCALITES

FOR BETTER LIGHT ON THE JOB

*Directs Light Exactly Where Needed
as Easily as Pointing Your Finger*
*Designed Especially for Machine
Tools, and Work on Assembly
and Inspection Benches*

Overall length 48 $\frac{1}{4}$ ". \$7.16 EACH
Three instantly adjustable joints. Circular base for machine or wood screw mounting. in pkg. of 6 Single Units \$8.95 ea.

MODEL 3470-P-172

- Rugged Construction to stand strains and shocks.
- Instantly Adjustable with full swivel ball and socket joints.
- Infra-red Baked Enamel Finish — Exterior, Wrinkled Gray — Reflector Interior, high temperature White.
- Reflector accommodates 100 watt A-21 medium screw base lamp.
- Wired Complete with switch socket and 8 ft. oil resistant cord.

WRITE FOR COMPLETE CATALOG
of Localite models with various type reflectors, arms and bases for every industrial use.

THE FOSTORIA PRESSED STEEL CORPORATION
Localites are available through selected distributors everywhere.

FOCALITE
fostoria
for Light ON the Job
Reg. U. S. Pat. Off.

CLEAR NAMEPLATE MARKING

Model
No. 4



The nameplate on your product is your signature; keep it neat and legible! Accurate location and alignment are assured with this

NAMEPLATE DETAIL PRESS.

- Simple Operation
- Perfect Alignment
- Uniform Depth

GEO. T. SCHMIDT, INC.
 1806 W. BELLE PLAINE AVE.
 CHICAGO • 13 • ILLINOIS

Anderson PILLOW BLOCK BALANCING WAYS

Especially suited for large diameter work, as a sub-base can be made of proper height to give necessary clearance for work. Anderson Pillow Block Balancing Ways are precision built with chilled iron discs which rotate with minimum friction on sensitive special bearings. Many manufacturers have endorsed them for profitable, efficient, static balancing.

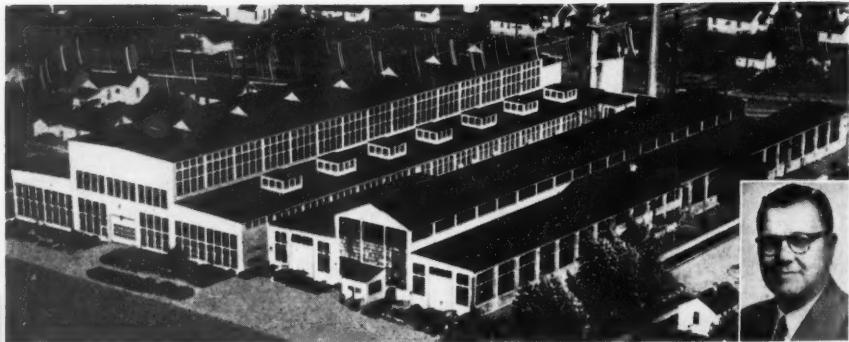


Built in 1,000, 2,000, 5,000, 10,000
and 20,000 Capacities

Write for Bulletin 10-22

ANDERSON BROS. MFG. CO., Rockford, Ill.

Balancing Ways, Roto Checkers, Hand and Power Scrapers,
Spotters, Hand and Power Hydraulic Straightening Presses



Aerial view of plant in Hamilton, Ohio, recently purchased by Clearing Machine Corporation.
Inset: M. E. Peterson, general manager of the new Hamilton Division.

Hamilton operation will be in the hands of M. E. Peterson, who was to have headed the Clearing activity in Joliet. Mr. Peterson has been with Clearing in various executive capacities since the company was formed in 1933.

Carpenter Steel Buys Webb Wire Works

Purchase of the Webb Wire Works, established for 50 years in New Brunswick, New Jersey, has been announced by The Carpenter Steel Co., Reading,



New **XL** BOND FOR CARBIDE TOOL AND CUTTER GRINDING

"XL" is Chicago Wheel's exclusive new bond for silicon carbide vitrified grinding wheels, especially made for grinding carbide cutting tools. Supplied in most popular sizes and steel backs. Prompt delivery. Keep your production up . . . costs down, with "XL."

Write today for information—Dept. MMS

CHICAGO WHEEL & Mfg. Co.
1101 West Monroe St., Chicago 7, Illinois
OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

MOLD YOUR OWN LEAD HAMMERS



Cook Molds and Ladies will produce lead hammers that can "take it" and save you money. Simple to operate.

**Write for Circular
VISES, HAMMER MOLDS, HANDLES**

LAWRENCE H. COOK, INC.
67 Massasoit Ave. E. Providence 14, R. I.

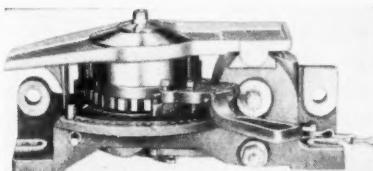
Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from $\frac{1}{8}$ " to $\frac{3}{4}$ " U.S.S. Inexpensive — Last for years.



**Write for Circular
NIELSEN TOOL & DIE COMPANY**
P. O. Box 1067
Berkley, Mich.

MODEL H AUTOMATIC Chucking & Indexing Fixture



1. 1800 light cuts per hour.
2. Either horizontal or vertical position.
3. Collets changed instantly.
4. Automatically knocks piece out.
5. Ratchet or degree indexing — degree indexing added later if desired. Capacity 1".
6. Automatic indexer also added later. Model F—Both degree and ratchet indexing Capacity up to $2\frac{1}{4}$ ".

Write for Folders

J. W. DEARBORN • Ansonia, Conn.

EXACT MEASUREMENTS REQUIRE PRECISION TOOLS



Accuracy of measurement depends on the precision of the measuring tools. Provide your Shop and Inspection Department with dependable and proper Inspection Tools. MEEHANITE METAL TOOLS, made to close tolerances, are furnished in many types.

**Surface Plates — Box Parallels
Slotted Angle Plates
Universal Right Angles
Flat Parallels — Lapping Plates
Toolmakers' Knees — Straight Edges
Masterangle Plates—Angle Attachments**

**WE RESCRAPE SURFACE PLATES
LIKE NEW
Send for Bulletin**

**ACME TOOL CO.
73 W. Broadway, New York 7, N. Y.**

Pa. Webb manufactures needle wire, stainless steel spring wire, and other specialties in small diameters.

Ernest H. Webb, president, has retired but is continuing for the time being as management consultant. Carpenter has appointed Everett F. Waltman as manager. The plant, which will be known as The Webb Wire Division of The Carpenter Steel Company, will continue to manufacture the same products for the same markets.

WHO The old reliable . . .
Wm. H. Ottmiller Co.,
of course.

WHAT Precision, milled-from-the-bar Cap Screws,
Set Screws, Milled
Studs and Coupling Bolts.

WHEN Some numbers we can
ship immediately—
others, well, you know how it is,
they'll take a little time.

WHERE For special
jobs contact us, for
catalog items see your
local Industrial Distributor

W.M. H. Ottmiller Co.
YORK, PENNA



Joseph F. Buhr

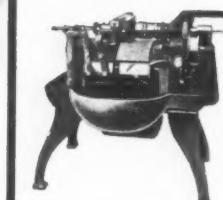
Joseph F. Buhr, board chairman of Buhr Machine Tool Co., Ann Arbor, Mich., died recently at the age of 74. Mr. Buhr came to America in 1897 from his native Alsace - Lorraine. He started as a molder in a foundry, later learned pattern making and then metalworking. He founded the Buhr Machine Tool company in 1925.



Joseph F. Buhr

For many years, the company was chiefly known as one of the leading U. S. manufacturers of multiple spindle drill heads. For the past few years, under the presidency of his son, Joseph H. Buhr, the company has concentrated exclusively on the manufacture of special machinery for a variety of uses in the automotive, aircraft and appliance industries.

Mr. Buhr also was president of Huron Gray Iron Foundry Company and American Pattern and Foundry Company of Ypsilanti, Michigan, and the R. & B. Tool Company of Saline, Michigan.



Thread Studs Faster WITH THE KENT Automatic STUD THREADER

Magazine feed. Threads both ends simultaneously and automatically. Minimum air cutting time. One man attends several machines. One machine threads studs $\frac{1}{4}$ " to $\frac{1}{2}$ " diam. One machine threads $\frac{1}{2}$ " to 1" diam. (Both in various lengths of threads and studs.)

The KENT MACHINE CO., Cuyahoga Falls, O.
Drillers - Threaders - Slotters - Countersinkers - Bar Pointers

ARTUS PLASTIC SHIM



AND
FEELER
GAUGE
STOCK

The COLOR
tells the
THICKNESS

Each thickness a distinctive, easy to identify color. Impervious to oil. Long lasting. 5"x20" sheets. Special sizes to order. Handy assortment, shim stock, 12 colors—12 thicknesses (.001-.030). Bound together. \$4.90.

Order today. Immediate delivery.

INDUSTRIAL PRODUCTS SUPPLIERS
201 S. Dean St., Dept. M, Englewood, N. J.

LOCKJAW

All-purpose
work clamps
Now in two Sizes!



Set-ups stay put when Lockjaw grips with both downwards and sideways pressure . . . grip is sure, powerful, self-locking . . . eliminates cumbersome bolting and clamping . . . saves time and work spoilage. Use Lockjaw on planers, radial drills, shapers, milling machines, surface grinders, boring mills and lathes.

Two sizes: Model B for large tables. Lighter Model A where table space is limited. Interchangeable jaws to fit work contours.

Write today for Bulletin 140-A.

RIVETT LATHE & GRINDER, Inc.
Brighton 35, Boston, Mass.
Dept. MMSA-10
For More Precision Work
RELY ON RIVETT, The Master Craftsman's Master Tools

Make A Clean Impression!

HAND-CUT STEEL STAMPS
Letters & Figures



Deep, hand-cut letters in special-formula steel assure clean impressions and long service. Face of stamp is angled for extra strength. Chamfered corners for locating the base. Ask for Hoggson Brand at mill supply houses.

HOGGSON BRAND
Since 1849

HOGGSON & PETTIS MFG. CO., New Haven, Conn.

cc Clark

**ADJUSTABLE
HOLE
CUTTER**

Finished cuts the first time in boiler plate, pipe, plastics, hard fibre, stainless steel, Transite, etc. 7 models cut variable expansions from $\frac{5}{8}$ " to 5" holes, with thickness capacities from thin sheets to 1".

ROBERT H. CLARK COMPANY
Beverly Hills, California MM-10

Manufacturer of Precision Cutting Tools

Micro Supreme

**LAY-OUT AND
IDENTIFICATION DYE**

13 COLORS

For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

**MICHIGAN CHROME &
CHEMICAL COMPANY**
6340 E. Jefferson Ave. • Detroit 7, Mich.

Saw Blade Reconditioning Process Announced by R. B. Tool

R. B. Tool Co., 785 N. Broadway, White Plains, N. Y., has announced a saw blade reconditioning process in which a saw blade is not only resharpened but the original efficiency is said to be restored by resetting the teeth to provide the necessary side clearance. With this process, worn-out tungsten, high speed steel, and molybdenum saw blades with from 4 to 14 teeth per inch can be sharpened and the teeth reset economically. Dull blades can be reconditioned several times, and even blades with broken-out teeth are said to lend themselves to this process.

Power hack saw blades reworked by the process are claimed to perform as well and last as long as new blades.

Lefax Dollar Technical Data Books. Lefax, Philadelphia 7, Pa., has announced a series of 15 new and completely revised Dollar Data Books for engineers, as follows: Aeronautics, No. 619; Air Conditioning, No. 638; Automotive Engineering, No. 602; Diesel Engineering, No. 640; Home Heating, No. 610; Machine Design, No. 606; Machinists' Data, No. 636; Mechanical Drawing, No. 617; Mechanics of Materials, No. 635; Metals, No. 621; Piping Data, No. 653; Power Transmission Machinery, No. 633; Steam Engineering, No. 620; Thermodynamic Tables and Charts, No. 634; and Welding Data, No. 645.

All Lefax Dollar Data Books are pocket-size, contain approximately 140 loose-leaf pages of selected data, and can be obtained at a price of \$1.00 each, postpaid. A catalog with more than 2,000 listings is available free upon request.



CAMS

Specially Designed
Exclusive Duplicating Process
ONE CAM OR A QUANTITY

Send Specifications for Quotation
L. G. SCHLECHT & SON, INC.
1628 N. Astor St. Est. 1919 Milwaukee 2, Wis.

**WANTED Most FOR HIGH ACCURACY
STAMPING OPERATIONS**

V&O
LONG SLIDE
Precision
POWER
PRESSES

Available in
sizes from 3 to
105-ton capacity.

V&O PRESS COMPANY
DIVISION OF EINHART MANUFACTURING COMPANY
Builders of Precision
POWER PRESSES and FEEDS
Since 1889 **HUDSON, N.Y.**

WRITE FOR CATALOG

*Long
Lasting
Life*

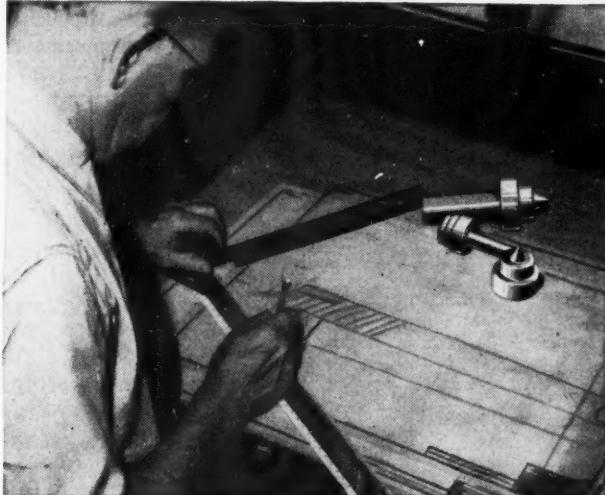
SECOMET

Diamond

WHEELS

cut faster
run cooler
and give
long life

J.K. SMIT & SONS
General Offices and Plant: Murray Hill, N.J.
J.K. SMIT & SONS
of MICHIGAN & CANADA



Engineered Live Centers . . . A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications—we will see that your job is set up with the right Live Center. Standard shanks with Morse taper carried in stock.

STURDIMATIC
COMPANY

DETROIT 16, MICH
F STREET • 3904

Metal-Working News in Brief

George E. Hopf has been appointed manager of the newly created Marketing Division of Henry Disston & Sons, Inc., Philadelphia, Pa., manufacturer of saws, tools, and special alloy steels. Mr. Hopf will have overall supervision of advertising, sales promotion, market research, and statistical and sales budgets for the company's five sales divisions.

George I. Ziders has been appointed industrial plant engineer for the Sanderson-Halcomb Works of Crucible Steel Company of America, Syracuse, N. Y. For the past ten years, Mr. Ziders has been associated with the Donora Steel & Wire Works of the American Steel & Wire Company.

— o —

William B. Pierce has been elected a vice president of Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa. Mr.

Pierce, who joined the company in 1945 as manager of the sales development and engineering service department, was named technical director in December 1950, when he was given responsibility for research and metallurgical activities. He will retain that position as a vice president.

— o —

Fred Bohle has been appointed manager of the recently organized Machine Tool Development Department of Illinois Tool Works, Chicago. He will have authority over all phases of development, design, production, and sales of Illinois Tool Works machines.

The advertisement features the brand name "Talide" in a stylized, bold font, with "TUNGSTEN CARBIDE" in smaller capital letters below it. Below this, the word "MEETS" is followed by "EVERY REQUIREMENT". The central image shows a large cylindrical bar of tungsten carbide. To the left, there is a die, and to the right, a stack of blades. The bottom section is divided into four quadrants: "TOOLS" showing two long bars, "ROLLS" showing a long cylindrical part, and "BUSHINGS" showing several bushings. The entire advertisement is framed by a decorative border.

METAL CARBIDES CORPORATION

YOUNGSTOWN 7, OHIO

SINTERED CARBIDES—HOT PRESSED CARBIDES

FINISHED

MACHINE KEYS



We are able to furnish the following types of finished machine keys of any size and taper: Gib head taper keys, Plain taper keys, Straight keys, Round end feather keys and Tit keys. We can supply you quickly with the quantities you need at the specifications you require.

Send for new catalog giving complete information on Woodruff keys, taper pins, machine keys and machine racks.

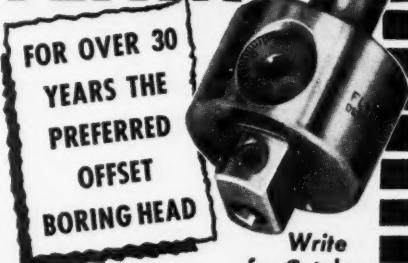
STANDARD STEEL SPECIALTY COMPANY

BEAVER FALLS

PENNSYLVANIA

PLANTS BEAVER FALLS, PA. • HAMMOND, IND.

FLYNN



Write
for Catalog

RIGID • ACCURATE • SAFE

- Ground micrometer offset screw.
- Large, easy-to-read graduated dial.
- "V" tool block, hardened, ground.

A model for practically every tool room and production operation.

FLYNN MANUFACTURING CO.
133 FLOWERDALE AVE. • DETROIT 20, MICH.

Nicholson Expanding Mandrels

SAVE TIME LOST Providing Solid Arbors

Records in many shops show Nicholson expanding mandrels actually get operations completed in less time than was formerly consumed in providing solid arbors. In cases this results in a tremendous cut in "down" time. Set of 14 Nicholson mandrels replaces 209 solid

arbors; for all bores $\frac{1}{2}$ " to 7". Sold singly or in sets.



BULLETIN 750 shows how these widely used tools save time and promote precision.

W. H. NICHOLSON & CO.

136 Oregon St., Wilkes-Barre, Pa.

Steam & Air Traps . Control Valves . Expan. Mandrels . Arbor Presses . Welded Floats

Metal-Working News in Brief

The Landis Tool Co., Waynesboro, Pa., manufacturer of precision cylindrical grinders, has appointed **J. S. Mourer** as manager of the company's Pittsburgh office, located at 4140 Brownsville Rd., Pittsburgh 27, Pa. Mr. Mourer, a factory trained man, previously worked in the Chicago area for Landis.

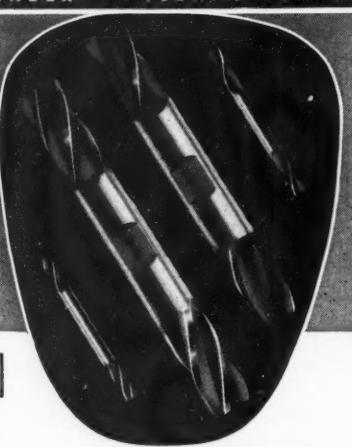
Meldrum MacPetrie, president of the Acromatic Tool Co., 21150 Coolidge Highway, Oak Park, Mich., manufacturer of high speed steel and carbide-tipped cutting tools, has announced the appointment of **A. William Tilder** as vice president and general manager. Mr. Tilder has a background of 25 years' experience in various phases of the cutting tool field and comes to the Acromatic Tool Company from Whit-

man & Barnes where he was manager of the carbide-tipped tools and Hercules punch division.

— o —

E. William Kalb has been appointed assistant manager of the Steel Sales Division of the Firth Sterling Steel & Carbide Corporation. Mr. Kalb previously served as supervisor for the Chicago branch of the Crucible Steel Company of America. **Arthur E. Gogol** has been appointed traffic manager of Firth Sterling's main plant in McKeesport, Pennsylvania. Mr. Gogol was previously associated with the Traffic Division of the Reading Railroad Company.

YESTERDAY'S PIONEER . . . TODAY'S LEADER



IF
you think
End Mills are
all alike

WELDON
DOUBLE-END
END MILLS
offer definite superiorities

YES, Weldon Double-End End Mills have all these advantages. In addition they give you double the service for less than the cost of two single-end end mills of equal size. They save production time too, because when you want to change the mill you need only turn it end for end.

Weldon Distributors throughout U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL CO. *Cleveland 4, Ohio*
3000 WOODHILL ROAD



*...for more than
1001 jobs*



HJORTH LATHE & TOOL CO.
8 BEACON STREET

WOBURN, MASS.



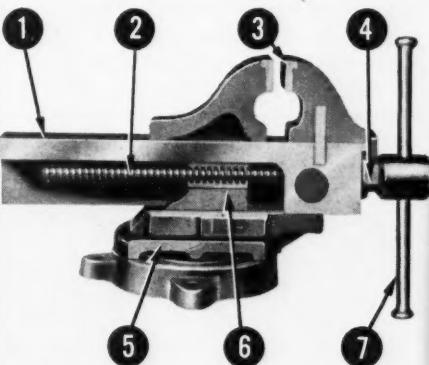
GRAY TURRET HEAD METAL CUTTER OR NIBBLER

N.A.M. Pioneer Award
Given to Gray

Most modern Nibbler for
Template Cutting, Tool Rooms,
Shipbuilding, Aircraft Parts,
Aircraft Tubing, Sheet & Plate Shops.

GRAY MACHINE CO.
Box 596, Philadelphia, Pa.

last word* on the first vise value



Desmond-Simplex vises are *first* in value
with the *most* usable, practical features—

1. All steel slide gives greater capacity; guaranteed not to fail.
2. Steel screw, fully enclosed and protected.
3. Stands heaviest blows: jaw inserts fit on shoulder. Screw takes no shock.
4. Easier lubrication due to outside retainer.
5. Full 360° swivel, positive-locking base.
6. Minimum backlash; longer, stronger vise nut lasts indefinitely.
7. One piece handle, non-pinching type.

... but the *last word** on vise value is
Desmond's unconditional guarantee against
defects in workmanship or materials for
the life of the vise! Buy vises for every
application from the complete Desmond
line at your industrial distributors. THE
DESMOND-STEPHAN MFG. CO.,
URBANA, OHIO.

GRANT

RIVETERS



* Pioneers in the riveting field. Head rivets from smallest to $\frac{3}{4}$ " diameter, either by noiseless spinning or vibrating hammer method.— Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles. Write for literature—and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
96 Silliman Ave. Bridgeport 5, Conn.

Desmond
SIMPLEX VISES

Metal-Working News in Brief

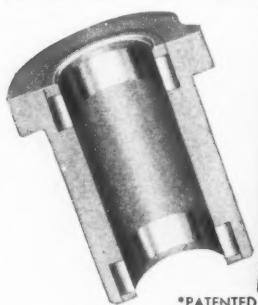
John B. Moore, manager of the Aviation-Industrial Chemicals Division of Fine Organics, Inc., New York 3, N. Y., has announced the appointment of the following representatives: **Paul R. Braniff**, Tulsa, Okla., for Texas and South-Central area; **James B. Schooler**, Kansas City, Mo., for Kansas, western Missouri area; **Aviation International Corp.**, Miami, Florida; **A. J. Bernard**,

Miami Beach, Florida; **George Hesington**, Lindenwold, N. J., for south Jersey and eastern Pennsylvania; **Industrial Cleaning Devices, Inc.**, Springfield, Mass., for New England States; and **Albon T. Wilson**, Clifton, N. J., for northern New Jersey area.

— o —

According to an announcement made by John F. Miller, vice president, **A. F. Zamis** has been appointed chief engineer of the Illinois Tool Works, Chicago, Ill. As chief engineer, Mr. Zamis will be in charge of engineering, design, and development work in connection with the company's complete line of metal cutting tools, including hobs, broaches, shaper cutters, milling cutters, and standard tools.

— o —



*PATENTED

This is it!

This cross-section tells its own story of how to save money on production drilling

Meyco Carbide Inserted Drill Jig Bushings

MEYCO bushings combine the best features of steel and carbide . . . the protection of steel with the long life of carbide at the points of wear. First cost: higher; end result: substantial savings in production costs. Made to ASA standards . . . MEYCO bushings will SAVE you money. Don't miss this bet! Many sizes now available from stock.

User Says:

"We have a jig setup where four holes are held to a limit of plus or minus .0005" on the spacing. MEYCO bushings were put into service . . . and, after completing 150,000 parts, the bushings show no appreciable wear."



Write for bushing catalog No. 16, for further details and a price list.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

Edward L. Zapp, chief metallurgist, Tube Reducing Corp., Wallington, N. J., since March 1943, died recently of a heart attack. Prior to joining Tube Reducing Corporation he had responsible positions with Henry Disston & Sons, Inc., and with Hyatt Roller Bearing Corporation.

**INCREASE
PRODUCTION
REDUCE
COSTS**



DURANT ROLL FEEDS

Accurate Feeding

Reversible

Easy to install

Highest quality

Immediate delivery

WRITE FOR CIRCULAR

DURANT TOOL SUPPLY CO.
155 ORANGE ST., PROVIDENCE 3, R. I.

INSPECTOR'S STAMPS



Faster
Identification
of Inspectors or Operators.
Different borders may be used
for different shifts. Available
in 4 sizes. Write for prices
today.

NEW METHOD STEEL STAMPS, INC.
145 JOS. CAMPAU DETROIT, U.S.A.

COMET

BORING, FACING, and INTERNAL THREADING TOOLS

For holes from $\frac{1}{8}$ " upward, 15 different sizes

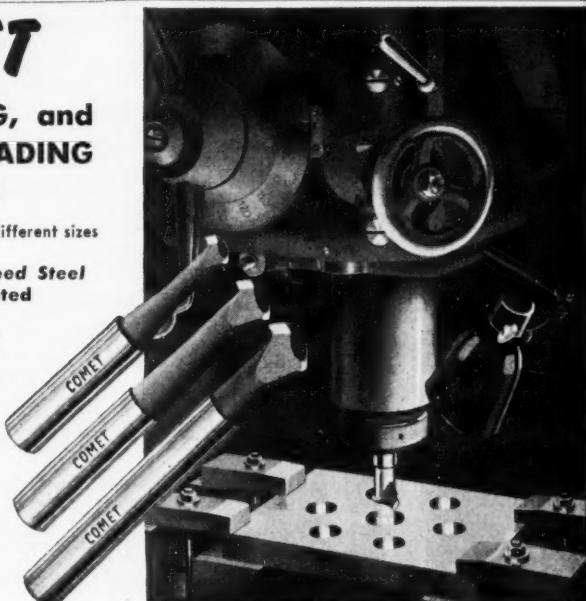
**Made of Super-High-Speed Steel
Specially Heat Treated**

Indispensable for your JIG BORER. The worm-like spiral of the boring heads provides a long useful cutting surface. Their use insures perfect fitting threads. Correctly designed for precision work.

Write for complete data.

Comet Tool Co.

738 Broadway
New York 3, N. Y.



Metal-Working News in Brief

The appointment of **Dr. Raymond C. Machler** as director of research and a member of the Executive Committee of Leeds and Northrup Co., Philadelphia, Pa., manufacturer of electrical measuring instruments, automatic controls, and heat-treating furnaces, has been announced by Charles S. Redding, president of the company. Dr. Machler,

formerly associate director of research, succeeds **I. Melville Stein**, who recently was elected to the newly created post of executive vice president.

— o —

C. Fred Watkins has been appointed sales manager of the Heller Brothers Co., Newark, N. J., and will make his headquarters in Newcomerstown, Ohio. Before joining the Heller organization, Mr. Watkins was associated with the

American Swiss File & Tool Co. as a salesman, then as assistant to the vice president in charge of sales, and more recently as general sales manager.

— o —

Kennametal Inc., Latrobe, Pa., has appointed **A. D. Griffin** as engineer and representative in the San Francisco district; and **Conrad Seim** in the South Pacific district. A serviceman, **Frank Hull**, has been added to the Central District office at Detroit. The Kennametal Inc. office in Cincinnati has been moved to 4873 Reading Road; and in Minneapolis it has been moved to 1016 Metropolitan Building.

TAC does what no other tool can do!

AT LAST! AN OPEN-END RATCHET WRENCH — the world's first true universal wrench. A patented design for connections on tubing, rods, piping, conduit, studs, etc. Sixty-four socket sizes from $\frac{3}{16}$ " to 4". Smallest effective ratcheting arc yet — 5° to $7\frac{1}{2}$ °. TAC will also do every job any ordinary ratchet wrench will do: one TAC set replaces literally dozens of single-purpose hand tools.

makers of advanced tools for industry

TAC®

TAC is the registered trademark of

TUBING APPLIANCE CO.
7112 South Victoria • 10321 Anza Ave. • Los Angeles, Calif.



CONTINUOUS HINGES

Manufactured by

**AUTO MOULDING
& MFG. CO.**

WRITE FOR STOCK LIST

1114 E. 87TH ST. CHICAGO 19



6" and 150 mm.
scale

Hardened
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THE HELIOS

Guaranteed Accuracy

\$10.50
f.o.b. New York

For details on other imported
calipers and micrometers
write

KARL A. NEISE

Dept. MMS

381 Fourth Ave., New York 16, N. Y.

BRING YOUR CARBIDE PROBLEMS TO

ADAMAC
Carbide Corporation
HARRISON, NEW JERSEY



BOOTH H-218

NATIONAL METAL EXPOSITION
DETROIT • OCTOBER 15-19, 1951

Metal-Working News in Brief

A. W. Miller, president of Portable Electric Tools, Inc., Chicago 20, Ill., has announced the appointment of **E. P. Wilmsen**, formerly a supervisor in the tax department of Lybrand Ross Bros. & Montgomery, Chicago, as controller of the company. **William C. McLean**, of the law firm of Zimmerman & Norman, Chicago, has been made secretary of the company, while **W. C. Hay**, former-

ly manager in the operations division of Marshall Field & Company, has been made manager of the service and traffic department.

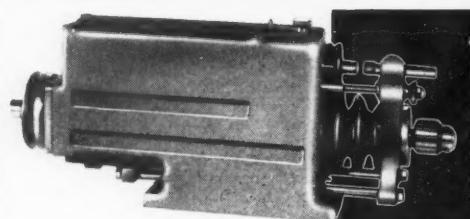
— o —

John T. McCarley has been promoted to assistant general manager and **Kenneth H. Bergstrom** succeeds him as manager of production at the Philadelphia Division of The Yale & Towne Mfg. Co., Philadelphia 15, Pa., manufacturer of hoists and industrial trucks. Mr. McCarley joined Yale & Towne in 1936 in its Automotive Division, while Mr. Bergstrom joined the Philadelphia Division in 1949 after having served the plant while on the staff of Barrington Associates, industrial management consultants.

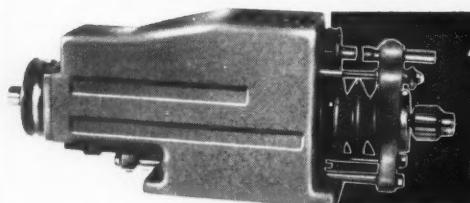
— o —

H. C. Ende, Jr., has been appointed Milwaukee branch manager for Crucible Steel Company of America, Pittsburgh, Pa. Mr. Ende joined Crucible as office manager of the Milwaukee sales office in 1945 and later became sales and service engineer in the territory.

NEW Compact Drilling Units



4000 Series
Heavy Duty,
self powered.
Drill to $5/16$ "
dia. in alloy
steel. Heavy
thrust pres-
sure.



4000 SA
Series
Light Duty,
Shop Air. Drill
 $1/4$ " dia. in
mild steel.

For Production Small Hole Work

- Both LOCKE units are capable of deep hole, dwell and jump gap drilling. $3\frac{1}{4}$ " overall width permits close assembly for multiple operations. Let us demonstrate or send for full information.

LOCKE
GAGE CO.

10232 Woodward Ave.
Detroit 2, Michigan

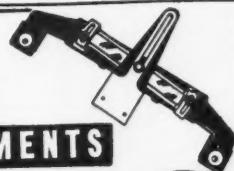


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SAFGUARD
FOR PUNCH
PRESSES**

STRAND MFG. CO.
P. O. BOX 762
DEPT. A,
LOS ANGELES 44, CALIF.

Quick
Shipment on

**TAPER
ATTACHMENTS**

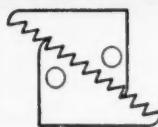


For All Lathes—Old or New—
9" to 36" Swing
Write for Bulletin
MASTER-TAPER COMPANY
4531 N. Beacon St., Chicago 40
Excl. Mfrs. of Taper Attachments

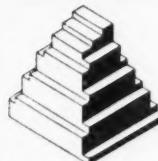
\$29.50
to
\$149.50

REID

Set-up Aids



Magnetic Blocks
and Parallels



T-Slot Bolts

Also Hand Wheels, Machine Handles,
Levers, Cranks, Plastic Balls, Cast
Iron Knobs, Machine Vises.

Write for Catalog and Prices on Complete Reid Line

REID TOOL SUPPLY CO.
709 BAKER ST.

MUSKEGON HTS., MICH.

42

STOCK SIZES

IN

HALLOWELL

**SOLID STEEL
COLLARS**

Precision machined for shafts
from $\frac{3}{16}$ " to 3" diameter inclusive.

Write for prices and name
of your nearest distributor.

SPS

STANDARD PRESSED STEEL CO.

JENKINTOWN 22, PENNSYLVANIA

Metal-Working News in Brief

Recently named to represent The Die Supply Company in its Pittsburgh sales district is **Thomas G. Schnorr** with offices at 122 S. Sheridan, East Pittsburgh 6, Pa. Formerly with C. H. Schnorr & Company, a Pittsburgh die and stampings manufacturer, the new representative is equipped to offer Die-Co customers practical assistance with their tooling problems in the procure-

ment of die sets, die springs, and miscellaneous tool, die, and machine shop accessories.

— o —

Robert E. Mitchell, district sales manager, has been promoted to field sales manager of the Cummins Portable Tool Division of Cummins-Chicago Corporation, according to an announcement made by **Mitchell A. Koplund**, vice president. Mr. Mitchell will take charge of sales training activities

and execute company sales policies and programs for Cummins portable tool branch offices and distributors throughout the country.

— o —

Tools and Abrasives, Inc., 1510-12 Oxford St., Fort Wayne 5, Ind., has been appointed an authorized distributor for the Fort Wayne, Indiana, area by the Carboly Department of General Electric Company, Detroit. Carboly standard tools, standard blanks, carbide-tipped masonry drills, and diamond impregnated carbide wheel dressers will be carried in stock by this distributor.

Hard to Please?

If you're looking for really fine quality heads, available at the lowest possible price, remember that our drill heads have been designed to answer fully today's drilling needs—and tomorrow's as well.

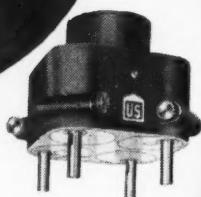
We manufacture all types of multiple spindle, fixed center, adjustable and individual lead screw tapping heads.



Two spindle head unit
—one spindle fixed,
the other spindle ad-
justable for the fixed
positions.



Universal joint with
slip spindle fixed
locating plate.



Single eccentric type for
equally spaced holes on
bolt circles.



UNITED STATES DRILL HEAD CO.
CINCINNATI 4, OHIO

JEMCO--- *Electric Nibblers*



MODEL 75



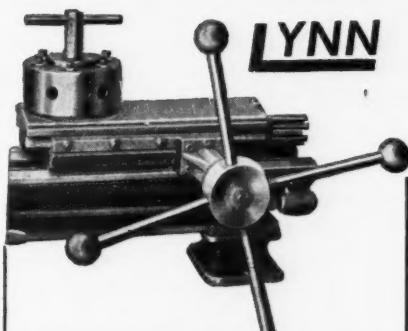
MODEL 50

For speeding up nibbling jobs, Jemco Electric Nibblers provide an effective and economical solution. Made in two models . . . No. 75 for cutting 14 gauge (.0747) . . . No. 50 for cutting 18 gauge (.0478) hot rolled sheet steel. Other materials in proportion. Jemco Electric Nibblers handle flat or corrugated sheets . . . uneven surfaces . . . and can nibble out corners! Cutting may be started anywhere on the material if access hole for anvil is made. Tools operate on either DC or AC . . . 110 or 220 volts. Feed: 3 feet per minute. Nibbling is done better, easier and faster with Jemco. Send today for full details and informative folders.

MANUFACTURED BY

JEFFERSON ENGINEERING
AND MFG. COMPANY

269 WALKER ST. DETROIT, MICH.



CONVERSION TURRETS & CUT OFF CROSS SLIDES

Fast Delivery

Especially adapted for the
following lathes:

Logan

Atlas

South Bend

Craftsman

Power Craft

Clausing

Sheldon

Large Turrets to Order

Convert your engine lathes for turret work. Put your idle or unproductive lathes into full-capacity production — *At Once*. Lynn conversion turrets are easily and quickly mounted on your present lathes—all set and ready for full-capacity, close-tolerance production, just like new turret lathes, but at a small fraction of the cost.

Machine Tool Division



Write,
Wire,
Phone

MANUFACTURING CO., Inc.
1121 So. Seventh St., Minneapolis, Minn.

Metal-Working News in Brief

Sterling Electric Motors, Inc. of Los Angeles has let contracts for the construction of a new one million dollar plant on an 11-acre site in Van Wert, Ohio. The new plant is designed for defense production to expand Sterling's gear manufacturing facilities for the production of precision gearing systems for the aircraft industry.

John P. Stitt has been named district sales manager in Cleveland for Brai-nard Steel Co., Warren, Ohio. He formerly was the company's representative in the Buffalo district. His post there has been filled by **James O. Tavener**, formerly in Brainard's main office in Warren, Ohio.

— o —

Establishment of a regional sales office and warehouse at 1221 Dragon Street, Dallas, Texas, has been an-

nounced by Minnesota Mining & Mfg. Co., St. Paul 6, Minn. Officials in charge of the new office and warehouse are **Walter F. Gruetzman**, office manager; **Ray Paulson**, sales manager for abrasives and related products; and **Fred Richardson**, sales manager for cellophane tapes.

— o —

Roger S. Ahlbrandt has been elected treasurer of the Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa. Mr. Ahlbrandt has been associated with the company for 17 years, having begun as a student trainee in 1934 after being graduated from the U. S. Naval Academy.

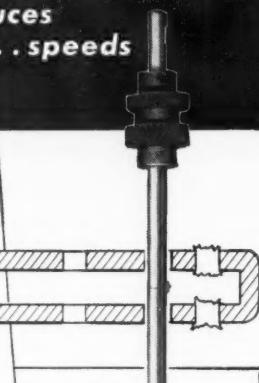
Deburring with NOBUR tool

on drill press reduces
production costs... speeds
deliveries!

MEMO

TO: Planning Dept.
FROM: Methods Engineer
NOTE: 75% saving in
time on Op. #4 and
16% in overall time.

Let's take fuller
advantage of
NOBUR



FG. CO.
OUTLINE

OPER. NO.	MACHINE	DESCRIPTION	TIME
1	TURRET	BORE 5 FACE PER PRINT	5 MIN
2	MILL	STRADDLE MILL PER PRINT	3
3	DRILL	10 HOLES LINE DRILL	6
4	BENCH	DE-BUR HOLE	4
4 (REV.)	NOBUR TOOL IN DRILL PRESS	NOBUR HOLES	1
		TOTAL	18 15

For further information, write or wire today

NOBUR MANUFACTURING COMPANY

717 NORTH VICTORY BLVD. • BURBANK, CALIFORNIA



DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Pa.

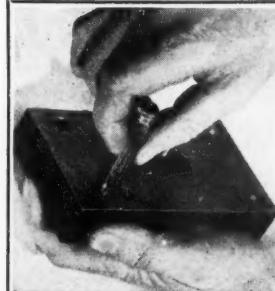
AT LAST!

A Low-Priced Dial Type Indicator

Has 2 contacts $1/32''$ threaded within $1/8''$. Double Faced. Reads front and back. Two Crystals. Double faced dial indicator complete with plated holder including $1/32''$ and $1/8''$ contacts—

Black Pentrate	\$6.95
Satin Chrome	7.95
$1/32''$ Contact, $1/2''$ long extension	.75

SUPERIOR INDICATOR CO.
P.O. Box 734
Rochester 3, N. Y.



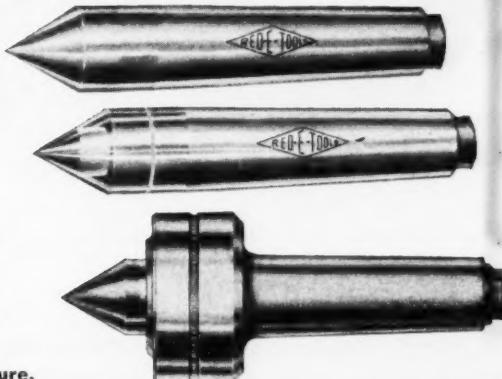
A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.

The Heimann Transfer Screw Set is a self-contained complete tool. No wrenches or pliers are necessary. Made in $\frac{1}{16}$ " to 1" diameters. Send for price list.

HEIMANN MFG. CO.
330 LINCOLN AVE.
URBANA, OHIO

RED-E CENTERS
for Lathes, Grinders, Spinning, Milling,
Railroads and Gear Cutting Machines.
ANTI-FRICTION • HIGH SPEED • CARBIDE TIPPED



RED-E is the only preferred complete line of Superaccurate Precision Centers that meet the exact requirements for Defense Production. When trouble free, efficient operation is a factor . . . choose a Red-E Center! Write for literature.



READY TOOL COMPANY

540 Iranistan Ave.

Export Dept.: 21 West St., New York 6, N. Y.

CENTER Specialists Since 1908

Bridgeport 8, Conn.

Metal-Working News in Brief

The Edmund Burke Co., 19 Seventeenth St., Toledo, Ohio, has been appointed representative of the Detroit Die Set Corporation for northwestern Ohio and three counties in southern Michigan. The Burke Company will serve as sales office for the complete line of Detroit die sets and diemakers' supplies.

Charles T. Nevins has been appointed to the sales staff of Heppenstall Company, Pittsburgh steel forgings manufacturer. Mr. Nevins will specialize in the sale of several types of equipment recently developed by the firm.

— o —

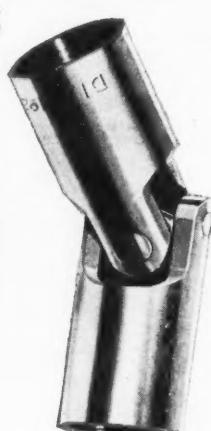
The Whitney Chain Co., Hartford, Conn., has announced the removal of its district sales office to new and larger quarters at 70 Dorman Avenue, San

Francisco, California. The office, which is under the direction of George F. Haag, district manager, will function as the engineering sales outlet for the complete line of Whitney power transmission and conveying chain, couplings, and sprockets in the San Francisco and northern California regions.

— o —

Jeff Coats has been appointed sales personnel division manager of the United States Steel Supply Company, and will be located in the company's general office in Chicago. Mr. Coats has been with the sales personnel division of the company in Pittsburgh since May 1950.

NOW ONE UNIVERSAL JOINT
For HIGH-load, HIGH-static torque Drives



Highest grade, heat-treated alloy steel for greater strength.

Ground to infinite degree of accuracy. No binding, backlash or play of pins. Concentricity guaranteed within .0005. Exceed Armed Forces rigid requirements.

14 SIZES—Bores 3/16" to 2".
Overall length 1 1/4" to 10 1/2".

WRITE FOR FULLY DESCRIPTIVE LITERATURE.

LOVEJOY FLEXIBLE COUPLING CO.

5007 W. LAKE ST.

Also mfrs. of Lovejoy Universal Joints & Variable Speed Transmissions

CHICAGO 44, ILLINOIS

HOWALD CARBIDE MILLING CUTTERS



PATENTED
END MILL

- **SQUARE BLADES**
Easily Replaced.
- Simple, Accurate
Blade Adjustment.
- Lowest Blade Cost.
- Cutters from 1½" to 14" dia.



SHELL
MILL

SEND FOR BULLETIN

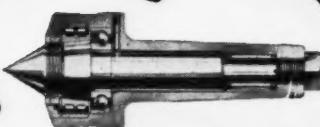
W. T. HOWALD

MACHINE WORKS

182 SIGOURNEY ST., BROOKLYN 31, N. Y.

NIELSEN

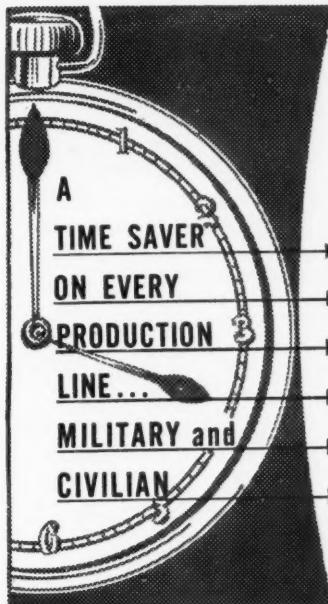
Heavy Duty Live Centers



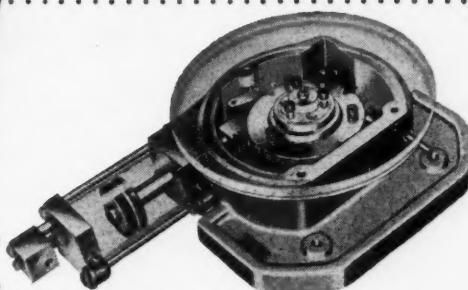
Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

Write for catalog
M on live centers

NIELSEN, INC. LAWTON,
MICHIGAN



A
TIME SAVER
ON EVERY
PRODUCTION
LINE...
MILITARY and
CIVILIAN



ALLEN AIR OPERATED DIAL FEED TABLES

- MODEL 11EA and 11EB
- Working Mechanism Completely Enclosed
 - Rock and Gear Drive
 - Adjustable from 4 to 24 Index
 - Guaranteed Against "Over-ride"
 - All Working Parts Flame Hardened

Please Write for Illustrated Brochure

THE A. K. ALLEN CO., INC. AGENTS IN
57 MESEROLE AVE. PRINCIPAL CITIES
BROOKLYN 22, N. Y.

Metal-Working News in Brief

H. Stanley Bimpson has been transferred to the office of the director of engineering of Allis-Chalmers general machinery division as consulting engineer. Mr. Bimpson has been with Allis-Chalmers since 1920 and, since 1947, has been chief engineer of the company's blower and condenser department.

The appointment of **Austin L. Hawk** as assistant manager of the Western Sales District, Manhattan Rubber Division of Raybestos-Manhattan, Inc., has been announced by the company's executive offices at Passaic, New Jersey. Mr. Hawk is located at 445 Lake Shore Drive, Chicago. **S. V. V. Hoffman** has been appointed regional manager of Raybestos-Manhattan's West Coast Sales Division for southern California, with headquarters at 4651 Pacific Boulevard, Los Angeles, California. In addition, **A. N. Johnson, Jr.**, has been named assistant manager of the Central Sales District of the Manhattan Rubber Division, with headquarters at 810 Empire Building, Pittsburgh, Pennsylvania, and **D. H. Cottrille** has been appointed West Virginia regional manager at Clarksburg, West Virginia.

— o —

Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y., has been appointed exclusive U. S. representative for Meteor, Ltd., Zürick, Switzerland, manufacturer of a line of machines and devices for grinding twist drills and taps.

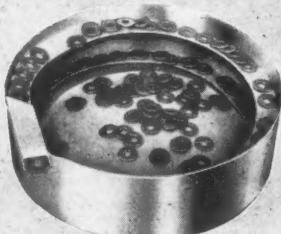
SYNTRON

"Vibra-Flow"

PARTS FEEDERS

Will feed parts . . . small, medium or large . . . of various shapes and materials . . . single file . . . in oriented position . . . at variable rates . . . WITHOUT DAMAGE . . . to grinders and presses, inspection and packaging devices, and other automatic processing equipment.

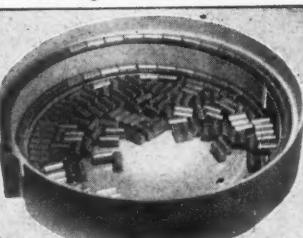
Units are very compact. Operate by controlled electromagnetic vibration—no motors, gears, cams, belts, etc., to require expensive maintenance.



Feeding Flat Washers



Feeding 5/8" Dia. Grommets



Feeding Steel Slugs

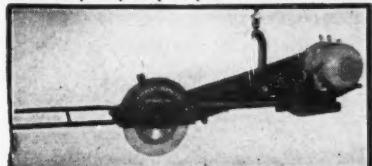
Catalog data upon request. Or send details of your problem along with sample parts to . . .

SYNTRON CO.

309 Lexington Ave.

Homer City, Pa.

MUMMERT-DIXON SWING FRAME GRINDERS
Sizes 12", 14", 16", 18", 20" and 24" wheels.



Ask for Descriptive Circular
MUMMERT-DIXON CO.
120 Philadelphia St. • Hanover, Pa.

READING BENCH KEYSEATER

Portable — move directly to job; a time saver for both small and large shops.

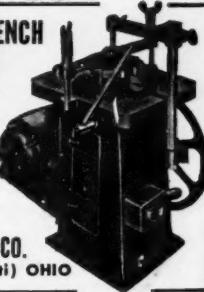
3 1/4" stroke; adaptable for other work.

Low first cost —

prompt delivery.

Good dealers wanted.

READING MACHINE CO.
READING (Cincinnati) OHIO



BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool
that Holds Work
at Any Desired
Angle.



Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Puts Speed and Profit into Angular
Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Made in several stock sizes. Write today for full information.

US AUTOMATIC BOX MACHINERY CO., Inc.

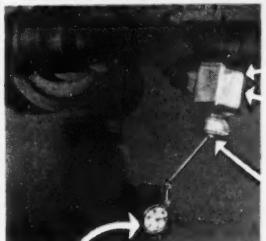
10 ARBORETUM RD.
BOSTON 31, MASS.

"MITI MITE" No. 100

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Book Reviews

A Basic Training Manual on Statistical Quality Control. By Rudolph Freedman and Joseph Movshin, in co-operation with the Industrial Engineering Department of Washington University. Published by St. Louis So-

cietry for Quality Control, 6651 Kingsbury, St. Louis 5, Missouri. Price, \$2.50.

This manual has been written for use in short elementary courses in statistical quality control. It may be used for in-plant training and short courses that are often given by technical societies. It may also be used as a laboratory manual in conjunction with a standard text on quality control in a full course.

The manual consists of a brief text which is included to serve as a set of notes for the student. The heart of the manual is a series of work sheets covering frequency distributions, X & R charts, p charts, pn charts, c charts and sampling. The manual has been written around the principle that "we learn by doing" and the work sheets afford the student an opportunity to perform exercises and to make the necessary calculations.

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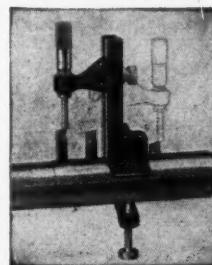
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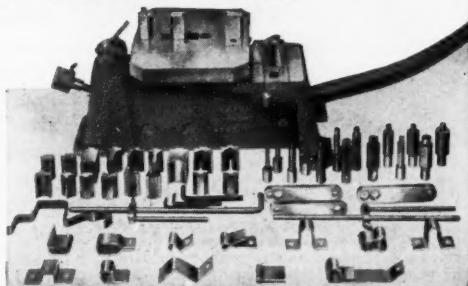
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Accident Prevention Manual for Industrial Operations. Second Edition. Published by National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. 800 pages. Green cloth binding, gold embossed cover. Price, \$9.00, to Council members; \$18.00 to non-members.

Practical ways to prevent industrial accidents and fires are explained in this second edition of "Accident Prevention Manual for Industrial Operations," which includes 256 more pages and 11 more sections than the first edition. Researched and written by National Safety Council staff men and then sent to qualified reviewers for comment and analysis, the material contained in this book is confined primarily to safety in the manufacturing industry and is based on the premise that a major proportion of all accident causes are common to all industry.

Subjects covered include permanent structure and plant layout; maintenance and maintenance crews; boilers; pressure vessels; refrigeration equipment; machine guards; materials-handling hazards; hand and portable power tools; welding and cutting; electrical hazards; flammable liquids; fire prevention; fire control; personal protective equipment; industrial health engineering; industrial poisons; medical services in industry; safety organization and training; accident records, analysis and costs. One of the new sections, "The Safety Man's Resources," is a bibliography of safety organizations and publications. (Reprints of the various sections of the book may be purchased separately for the use of supervisors, and others in the foremanship group.) In addition to the table of contents, each section of the book lists its own contents. There also is an exhaustive alphabetical index.

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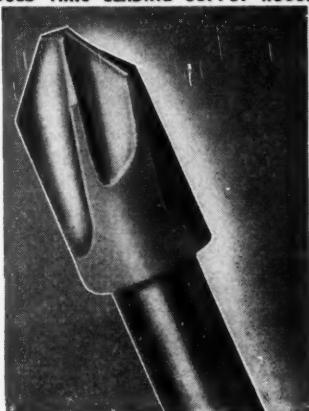


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Management Strategy in Collective Bargaining Negotiations. Published by National Foremen's Institute, Inc., 100 Garfield Ave., New London, Conn., 198 pages, 8½ x 11 inches. Multi-ring binder, heavy Fabrikoid gold-stamped cover, Price, \$5.50.

This manual is divided into five sections that deal with the "know-how" of labor negotiations. They are: I. Why

Unions Act as They Do; II. Union-Management Relations and the Law; III. Basic Union Aims and Management Bargaining Strategy; IV. Safeguarding Management Rights; V. Conduct at the Bargaining Table. In addition, there is an appendix that gives the text of the Labor Relations Taft-Hartley Act, as well as a sizeable index on specimen contract clauses.

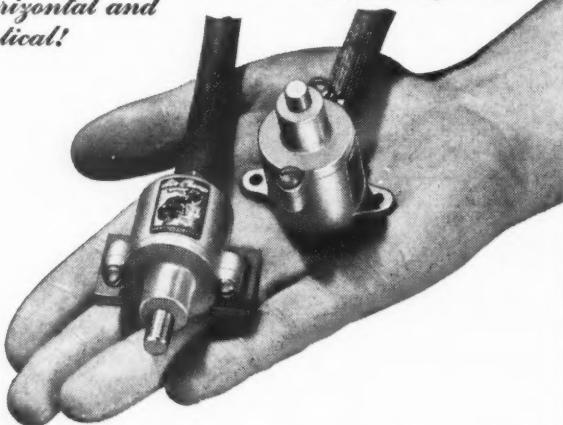
In these practical sections are actual specimen clauses used by a number of companies in their labor agreements, including pointers on how to select the right clause to fit particular agreements. In addition, there are employer tips on how to avoid pitfalls that lead to legal difficulties, whether the company or plant is unionized or not.

The working precepts set forth in the manual are those which have been actually used successfully by the field staff of the National Foremen's Institute in handling collective bargaining for those companies it has represented in negotiations. The editorial and field

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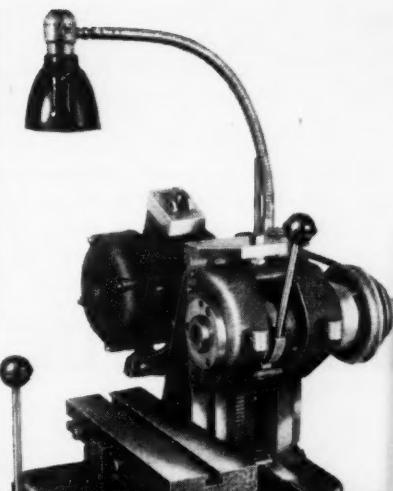


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staff in collaboration have reviewed all rulings and court decisions which have emerged from the practical application of the law to collective bargaining.

Frontiers of Personnel Administration. Edited by Richard B. Edwards. Published by Department of Industrial Engineering, Columbia University, New York 27, N. Y. 160 pages, 8½ x

11 inches. Cloth binding. Price, \$12.50.

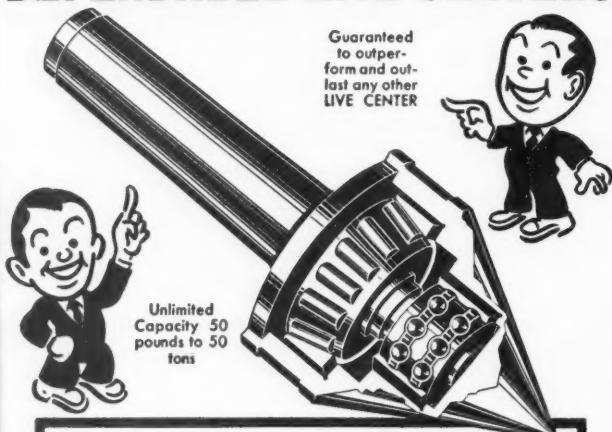
This volume comprises the reports and papers of the meetings which were conducted during the 1951 Conference of Industrial Personnel held March 19-23 at Columbia University. Material in the book is arranged according to subject matter (for best continuity) and not necessarily in the order of occurrence on the conference floor.

All questions from the floor, as well

as formal and informal discussions, were reported and transcribed. Upon conclusion of the conference, the various speakers reviewed their material to clarify or expand where indicated by the experience of discussion at the conference. The articles were then edited to make sure that questions raised were fully covered in the text material.

The book is, therefore, a series of chapters or sections, each one presenting a separate and distinct subject. In design, one further practical step was taken; namely, the layout was arranged so that each subject begins on a right-hand page and the entire chapter

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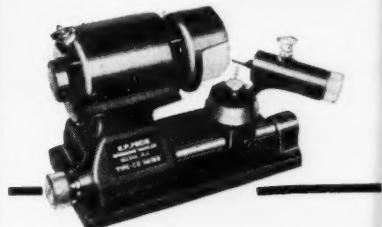
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The Structure and Mechanical Properties of Metals. By Bruce Chalmers. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 132 pages. Cloth binding, board covers. Price, \$3.50.

In this book, which is designed to provide an elementary discussion of the subject, Dr. Chalmers, professor of physical metallurgy at the University of Toronto, describes the process of mechanical deformation and evaluates the effects of distortion and heat treatment on the structure of pure metals and alloys. He supplies a brief account of the ways in which the structure can be examined and determined, and concludes with a discussion of the more mechanical properties and their dependence on the structure.

Assuming that the reader has a general elementary background in physics and chemistry, the author avoids mathematical considerations. His illustrations and examples are of a non-technical nature.

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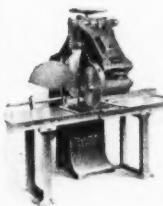


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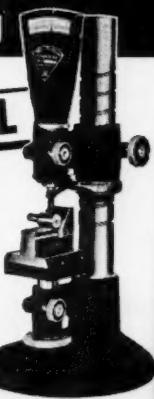
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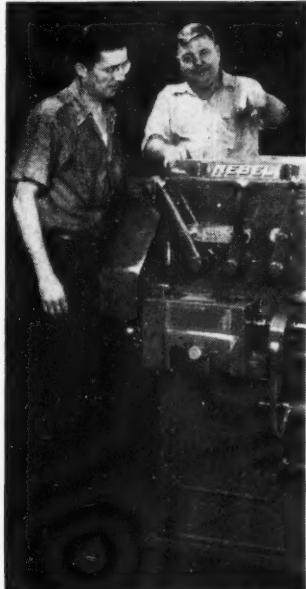
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Planning for Peak Production (Production Series No. 197). Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 47 pages. Heavy paper covers. Price, \$1.25.

This booklet comprises papers presented at the Production Conference of the American Management Association held at The Waldorf-Astoria, New York City, March 26-27, 1951. Included are papers on achieving increased operating effectiveness through (1) pro-

duction planning, (2) methods improvement, and (3) training. Also contained in the booklet are papers of a panel session discussing the impact of the wage freeze on labor, the impact of the wage freeze on employee-employer relations, and the impact of Regulations Five and Six.

Machining of Stainless Steel. Published by Metal Cutting Tool Institute,

3114 Chrysler Bldg., 405 Lexington Ave., New York 17, N. Y. 27 pages. Heavy paper covers. Price, \$1.00.

Prepared by the Engineering Committee of the Metal Cutting Institute, this booklet deals with the milling, drilling, reaming and threading of the commercial grades of wrought stainless steel. The contents of the report are divided into four sections. Section I discusses the compositions and general characteristics of the wrought stainless steels, while Section II presents practical considerations in machining stainless steels. Section III covers tool

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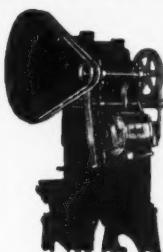
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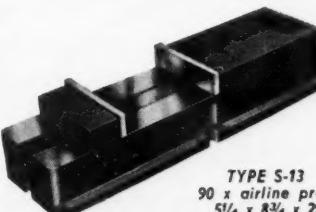
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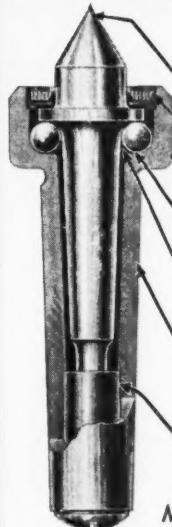
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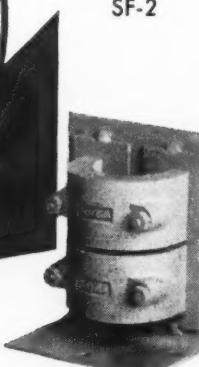
designs, tool materials and operating data for machining stainless steel. The final section includes information on coolants or lubricants for machining stainless steels.

Materials Problems of the Emergency and Producing for the Armed Services (Production Series No. 198). Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 59 pages. Heavy paper covers. Price, \$1.25.

Included in this booklet are several papers presented at the Production Conference of the American Management Association held at The Waldorf-Astoria, New York City, March 26-27, 1951. Titles of some of the papers are as follows: "The Government's Conservation Program," "Conservation and Substitute Materials," "The Pattern of Our National Production," "The New Controlled Materials Plan," "Government Controls—Their Effect on Procurement," and "The York Plan of Industrial Mobilization." Also provided are papers of a panel session on meeting the armed services' quality requirements, including discussions of the quality control policies of the Air Force, Army, and Navy.

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Punch Shaper. Triplex Machine Tool Corp., 75 West St., New York 6, N. Y., has available an eight-page attractively printed catalog on the Sentinel Punch and Form Shaping Machine which, although primarily designed for the accurate and economical production of punches, can also be used as a production machine when small batches of profile parts are required. The catalog illustrates and describes in detail the design and method of operation of the machine, as well as its operating features. Some of the standard shaping tools and the two toolholders and cutting tool templates supplied as part of the standard equipment of the machine are also shown, as well as examples of blanking punches and complicated profile parts which can be produced economically on the Sentinel Punch Shaper.

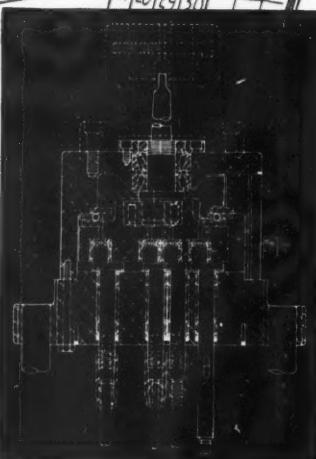
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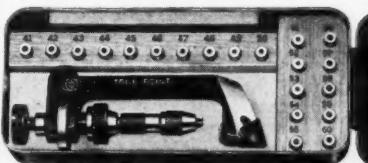
ATLANTIC
GEAR WORKS, INC.

198-ALAFAYETTE ST. • N.Y. 12, N.Y. CA 6-1440

TRUE POINT DRILL SHARPENER

for number drills 41 to 60
and No. 61 to 80

Right and Left Hand



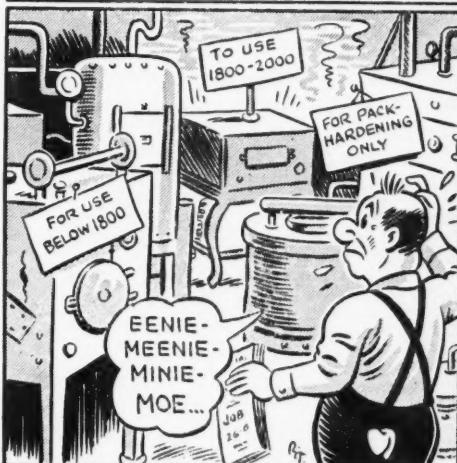
Indispensable for accurate tool work, fast and handy to operate.

AGENTS IN PRINCIPAL CITIES
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UP-TO-DATE TOOL CO., M-3

P. O. Box, Station A
Worcester 8, Mass., U. S. A.

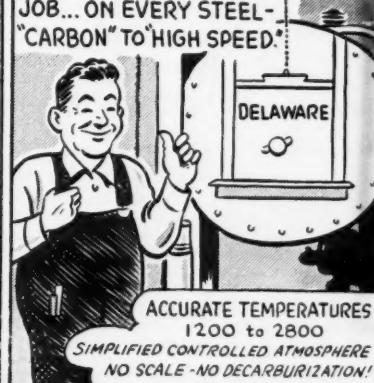
A FURNACE FOR "EVERY PURPOSE"... OR AN ALL-PURPOSE FURNACE?



FURNACE DIVISION

DELAWARE TOOL STEEL CORP.
WILMINGTON 99, DELAWARE

DELAWARE IS THE ONE FURNACE
FOR EVERY HEAT TREATING
JOB... ON EVERY STEEL-
"CARBON" TO "HIGH SPEED."



SEND for informative Bulletin F-1. It gives you the straight facts about the DELAWARE CONTROLLED ATMOSPHERE FURNACE.

Socket Screw Products. A complete line of button head socket cap screws, including detailed engineering data, is featured in a 28-page catalog (No. 51) published by The Holo-Krome Screw Corp., Hartford 10, Conn. Also contained in the catalog is full information on all other products manufactured by Holo-Krome's "Completely Cold Forged" process, including socket set screws, socket head cap screws, flat head socket cap screws, socket head stripper bolts, and socket pipe plugs. In addition, the catalog presents details concerning dowel pins, socket screw keys, and key sets. Information of interest to designers, engineers, and production executives is con-

tained in the breakdown listings which catalog standard H-K Fibro Forged products, as well as "specials" which are made to order only.

Chemical Coolant. F. E. Anderson Oil Co., Portland, Conn., is now offering a profusely illustrated booklet describing "Lusol," an all-chemical cutting fluid. The booklet covers in detail the properties of the coolant which are said to provide for the elimination of dermatitis and odor, as well as the elimination of cleaning and degreasing operations before painting, plating, or assembly. Data is also presented on the cleaning of machines, mixing and maintenance of coolant solutions, and case histories of the product in use in almost every type of metal-working operation.

Vises and Platens. Donovan Mfg. Co., 80 Batterymarch St., Boston, Mass., now has available a four page two-color folder containing illustrated, descriptive, and tabular information, including dimensions and prices, on platens, multi-swivel platens, multi-swivel bases, swivel vises, flanged vises, and multi-swivel vises.

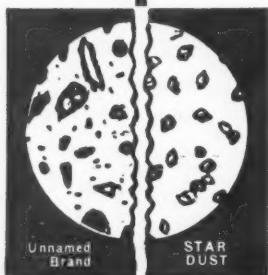
Collet Chuck. Hall Mfg. Co., 622 Tularosa Dr., Dept. B, Los Angeles 26, Calif., now has available a four-page two-color bulletin on a collet chuck with positive automatic adjustment. The 1 and 2-inch sizes in which the chuck is available are fully illustrated and described, and prices of the two chuck sizes and their components are listed.

You're LAPS AHEAD with

ACE Star Dust 
DIAMOND LAPPLING COMPOUNDS
AND DIAMOND POWDERS

Laboratory
Grading
Does it!

MIRROR FINISHES IN MINUTES ON DIES,
TOOLS, MOLDS AND PRECISION PARTS



ACTUAL MICROPHOTOS PROVE
STAR DUST SUPERIORITY AT
A GLANCE . . .

STAR DUST is so accurately crushed and graded by Ace's new laboratory method that it achieves uniform nodular shape, permitting all particles to work. Thus you are assured finishes of less than half a micro inch, quicker than ever before. By contrast, note lack of uniformity and the flats in the "unnamed" brand that prevent accurate finishing!

• STAR DUST USERS REPORT AVERAGE SAVINGS IN POLISHING TIME OF MORE THAN 70%: Available in ophthalmic-tipped tubes or in new applicator gun that delivers minimum quantities to individual jobs and eliminates all waste . . . In all grit sizes as fine as .0001".

Write today for informative bulletin No. B-10.

**ACE ABRASIVE
LABORATORIES** | 250 WEST 57th STREET
NEW YORK 19, N. Y.

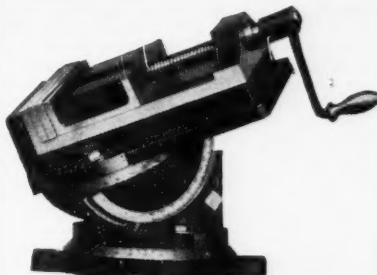
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THROWING AWAY
MONEY!**

if you junk your old power hacksaw blades. Send them to us for **RESETTING** and sharpening, and we'll return them to you as good as new.

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and price list.**

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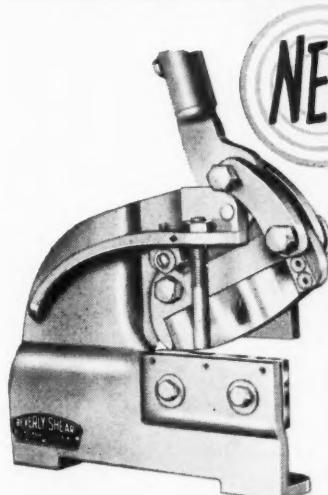


SAVE TIME!

on intricate, angular set-ups with the **MASTER MULTI-SWIVEL VISE**. Fully universal. 3 swivels instantly set any compound angle. Parts interchangeable. Optional accessory: Platen, interchangeable with vise. This vise used in machine shops throughout the world.

Circular on request.

DONOVAN MFG. CO.
80 BATTERY MARCH ST., BOSTON 10, MASS.



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**Beverly
SLITTING SHEAR**

**MORE POWER . . . Easier Cutting
EXCLUSIVE DESIGN . . . Cleaner Cuts
RUGGEDLY BUILT . . . Last a lifetime
CAPACITIES TO 3/16"**

Get faster, easier slitting and trimming with a new design Beverly "SS" Series Slitting Shear. Rigid, strongly braced frame; compounded linkage and extra strength where needed. Many exclusive features. Write for FREE illustrated Bulletin.

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Ask for a demonstration—no obligation.*

Beverly SHEAR MFG. CO.

3000 W. 111th STREET • CHICAGO 43, ILLINOIS

SS-3 3/16" slitting cap;
5/16" trimming; 1/4"x2"
bar capacity.

Cutting Oil. A bulletin descriptive of Fiske's C.S.A. No. 2 Cutting Oil for machining all types of aluminum and aluminum alloy metals has been released by Fiske Brothers Refining Co., 129 Lockwood St., Newark 5, N. J. Information on Fiske's Majestic Soluble Oil for rolling aluminum ingots and Fiske's Magic Compound for wire drawing, forming, and stamping is also presented.

Carbide Cutter Sets. Four new rotary carbide cutter sets containing the most popular all-purpose tools in the Ford car-

bide line are illustrated and described in "Ford Filings" No. 7 available from M. A. Ford Mfg. Co., Inc., Dept. V-7, 732 W. River, Davenport, Iowa. Tool sizes described in the folder include $\frac{1}{4}$ -inch bodies on $\frac{1}{4}$ -inch shanks, $\frac{1}{8}$ -inch bodies on $\frac{1}{8}$ -inch shanks, and $\frac{1}{4}$ -inch bodies on $\frac{1}{8}$ -inch shanks.

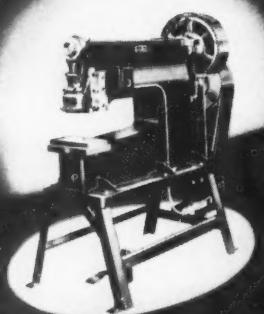
Cutting Tool Holders. An attractive eight-page catalog on cutting tool holders has been prepared by Ready Tool Co., 540 Iranistan Ave., Bridgeport 5, Conn. The catalog illustrates and describes

spring toolholders of all types and sizes, including designs for threading, forming, and cutting, as well as lathe tool holders, shaper and planer tools, boring bar and internal threading tool holders, tool bits, and blades. A section of the catalog is also devoted to the Red-E Tap-A-Hammer and ball chains.

Machine Tools and Accessories. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., now has available individual bulletins on three new G. & L. machines, another bulletin on its new 54-inch to 6-foot heavy Hypro vertical boring and turning mill, and also a 20-page bulletin describing accessories and attachments for horizontal boring machines. Information contained in each bulletin explains how G. & L. equipment can be used to solve difficult production problems. Each bulletin is fully illustrated throughout.

WHITNEY METAL TOOL COMPANY

41 YEARS EXPERIENCE



WHITNEY-JENSEN

No. 230 - No. 231 DEEP THROAT
POWER PUNCH PRESSES

These sturdy, deep-throated presses are widely acclaimed for their high speed and accurate production. Frames are welded steel; auxiliary attachments available; various punches and dies in stock for these two outstanding models.

Capacity: 20 tons
Throat Depths: 18" and 24"

WHITNEY METAL TOOL COMPANY
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Why THOR STAMPS Last Longer



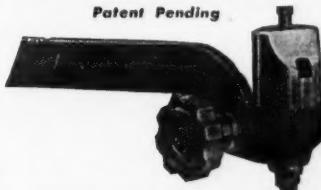
... because they're made of a special, correctly-heated alloy steel. Central striking point assures uniform marking. Thumb side marking assures easy use.

You get more mark per dollar with THOR STAMPS. Write for catalog and prices.

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812 CANAL ST. • PITTSBURGH, PA.

Monarch Precision **SHAPLANE** Radius Tools

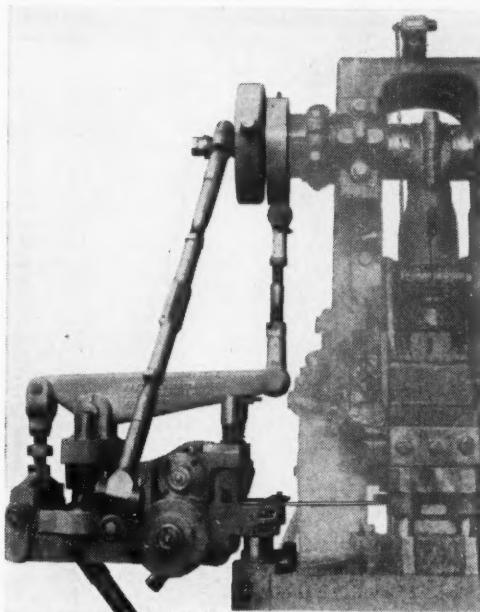
Patent Pending



Five Models for
**LATHES, SHAPERS, PLANERS,
AND BORING MILLS.**

RANGE $\frac{1}{2}$ " TO 3" RADIUS (MODELS ALSO
AVAILABLE FOR CONVEX CUTTING, AND
CONCAVE RADII TO 6" ON PLANERS, ETC.)

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Tool Room Specialties
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**Roll Feeds
Stock Cradles
Stock
Straighteners**

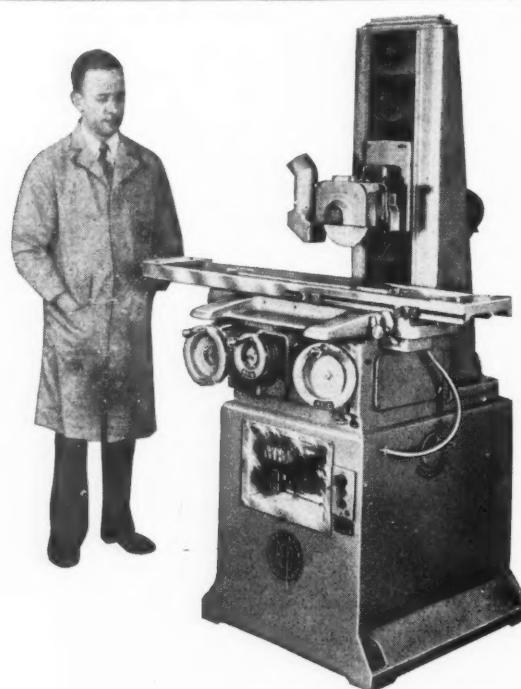
WHYTE
Engineering Inc.

185 ROWLAND STREET
SPRINGFIELD, MASS.

Gas Burning Equipment. Johnson Gas Appliance Co., 571 E Ave., N. W., Cedar Rapids, Iowa, has issued a 24-page catalog (No. 51) which illustrates and describes the company's line of gas burning equipment, including burners; furnaces for hardening, tempering, and annealing; valves; torches; mixers; and blowers.

Welding Equipment. Smith Welding Equipment Corp., 2619-33 Fourth St., S.E., Minneapolis 14, Minn., now has available a 44-page catalog (No. 350-2) containing illustrated, descriptive, and tabular information, including prices, on a complete line of welding equipment comprising various types of torches, tips,

electrode holders, adapters, eye shields, goggles and spectacles, trucks, fluxes, sleeves, brushes, manifolds, lenses, helmets, handshields, hose, hose clamps and connections, pressure gages, aprons, cutting and welding outfits, and various other equipment.



REID SURFACE GRINDER MODEL 618V
WITH VARIABLE TABLE SPEED - 12 to 35 Feet Per Minute

REID BROTHERS COMPANY, INC.
BEVERLY - MASSACHUSETTS

Retaining Rings. A series of engineering bulletins covering all types of Walde Truarc Retaining Rings, grouped by specific ring function, has been issued by Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y. Bulletin 6 is devoted to a series of retaining rings specially developed to take up end-play and compensate for varying manufacturing tolerances and wear. Bulletin 7 covers a series of external type rings that is applied radially without pliers and is recommended for positioning machine parts on shafts, especially where a groove is inaccessible in an axial direction. Bulletin 8 deals with a series of retaining rings that form artificial shoulders for positioning and retaining machine parts on shafts or in housings.

Rotary Cutting Tools. Severance Tool Industries, Inc., 724 Iowa St., Saginaw, Mich., has published a 16-page catalog illustrating, listing, and describing a wide variety of small tools, including midget mills, carbide mills, inside and outside deburring cutters, outside chamfering mills, hand and tube deburring cutters, tube chamfering mills, solid tube deburring cutters, countersinks, ball seat reamers, and other items.

At last! A LOW COST AUTOMATIC No Snatch Horizontal STOCK REEL

THE JACO REEL

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Pats.
Pending

Rotates at just the speed to suit punch press feed. No power needed. Stock is taken from center of coil which lies on turntable. Natural spring of uncoiling material develops torque sufficient to rotate the 30" diam. ball-bearing mounted platen. Will handle practically any resilient coiled material up to 6" wide. WRITE Today for Details.

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Hundreds of
Satisfied
Users—here
and abroad.

JACO DEVICES, Inc., 102 High Street, Hingham, Mass.

Tap #0 to $\frac{3}{4}$ " with . . .

1

Commander TAPPER

The Commander Tapper's exclusive torque control thinks for its operator—automatically stops when taps are dull, overloaded or strike bottom in blind hole tapping.

You get maximum tap protection because the torque control can be set to protect all taps in the range from No. 0 to $\frac{3}{4}$ ".

Spring clutch drive eliminates slippage and wear—provided smooth, quiet, easy operation.

Commander Tappers are furnished to fit any drill press.

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COMMANDER MFG. CO.
4224 W. Kinzie St. Chicago 24, Ill.



Any operator
does precision
tapping with
a Commander
TAPPER

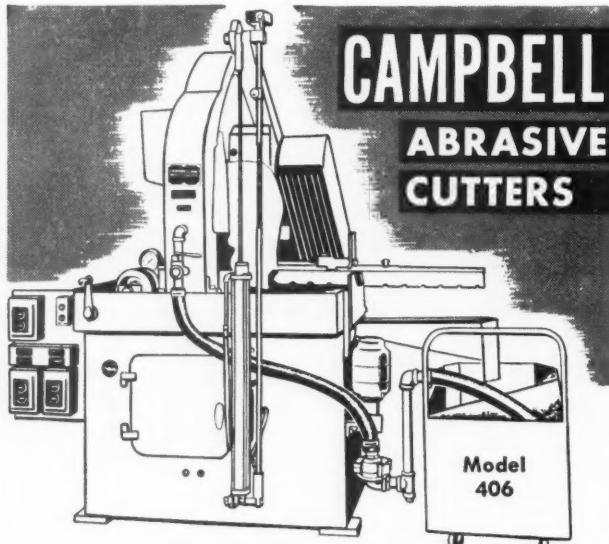
Write for illus-
trated circular
and name of
nearest
DISTRIBUTOR

Product of Commander . . . Builder of the Multi-Drill

Valves. A 44-page illustrated catalog describing its complete line of valves is now available from Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich. Hundreds of standard models and modifications are described, including straightway, three-way, four-way, and four-way five-port units in various sizes of hand, foot, solenoid, pilot, remote control, cam, speed control, shutoff, quick exhaust, and miscellaneous valves. In addition, several pages of the catalog are devoted to general reference data, including a non-technical explanation of air valve operation and the difference between various types.

Enclosure Guard for Presses. Strand Mfg. Co., P. O. Box 762, Los Angeles 44, Calif., has prepared a leaflet illustrating and describing the Strand Enclosure Safeguard which can be easily adapted to accommodate various dies on presses.

Precipitation-Hardening Stainless Steels. A 16-page illustrated booklet published by Armco Steel Corp., Middletown, Ohio, describes the properties, available forms, and fabrication of both Armco 17-4 PH and 17-7 PH Stainless Steels which are said to combine excellent corrosion resistance with high strength and hardness and good fabricating characteristics and can be hardened at low temperatures. The booklet also outlines the properties of Armco 17-7 PH Stainless Steel Wire which is claimed to combine excellent corrosion resistance with elastic properties and can be used in a wide variety of applications.



Ready for the Emergency

- A complete line for cutting all metals—ferrous or non-ferrous—hard or soft. Re-engineered for higher production performance and lower over-all cost. Many automatic features. Cutting disc enclosed in steel guard. The safest abrasive cut-off machine made.

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ACCO



Tell us your problem—
we'll make recommendations

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

931 Connecticut Ave., Bridgeport, Conn.

Roller Chains and Sprockets. Catalog RS-50 covering a full line of roller chains and sprockets has been released by Whitney Chain Co., 243 Hamilton St., Hartford 2, Conn. The catalog provides complete specifications and engineering reference tables on American standard roller chains, sprockets, and attachments. Dimensional data, strengths, and weights are also supplied on allied products, such as block chain, cable chain, and flexible couplings.

FROM STOCK

Immediate
Delivery

Arbor Spacers For Milling Machines

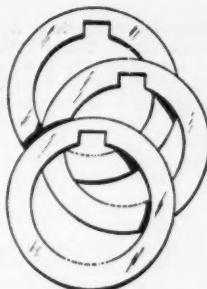
IN SETS (STEEL)

Set contains 19 pieces: .001, .0015, .002, .003, .004, .005, .006, .007, .008, .010, .012, .015, .020, .025, .047, .062, .093, .125.

[For fast, accurate spacing of Milling Cutters, Gang Saws, Slitters.]

3 POPULAR SIZES	Hole Diameter	Outside Diameter
	7/8"	1 3/8"
	1"	1 1/2"
	1 1/4"	1 3/4"

PRICE
PER SET
\$1.50



MILLING MACHINE ARBORS



DEALER INQUIRIES INVITED

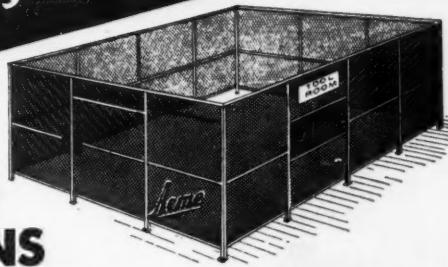
We carry a full range of drills, taps, dies, reamers, etc. Write for complete listing.

GRAND TOOL & SUPPLY CO.
231 CENTRE ST. • WORTH 4-6671 • N. Y. 13, N. Y.

Taper of Arbor	Dia. of Arbor	Lath. of Arbor from S.T.N.	Price F.O.B. N.Y.C.
B & S No. 9	1"	6"	\$17.50
"	10	6"	18.00
"	9	8"	17.75
"	10	8"	18.50
"	9	7/8"	17.75
"	10	1 1/4"	20.50

Leaders over 50 years
Established 1899

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Standard Sections Woven Wire Mesh Panels and
Doors to enclose Tool Cribs, Stock rooms and other
enclosures.

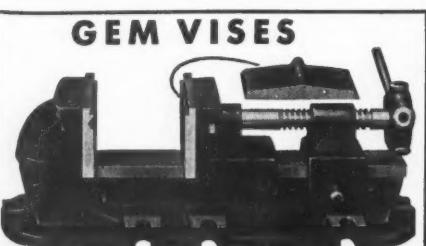
IMMEDIATE DELIVERY

Write for Catalog

Acme Wire & Iron Works
3527 E. Canfield — Detroit 7, Mich.

Semi-Automatic Gear-Hobbing Machine. How time savings exceeding 50 per cent are effected by automatic radial and longitudinal feed in gear-hobbing is described in a six-page descriptive folder on the Lambert Type 75 Semi-Automatic Gear-Hobbing Machine now available from Carl Hirschmann Co., 30 Park Ave., Manhasset, New York.

Cutting-Off Machines for efficient high speed cutting-off of tubing, pipe, and bar stock are illustrated and described in detail in a 12-page bulletin published by Modern Machine Tool Co., Jackson, Mich. The bulletin includes information on fully automatic and manually-operated cut-off machines, as well as data on a cropping machine and safety drill table.



Made in a range of sizes and types, to handle most any kind of machining operation, where vises are applicable. Write for circular, etc.

J. E. MARTIN MACHINE WORKS, Springfield, Ohio

Gear Production Methods. Individual technical bulletins dealing with gear production methods and explaining how gear production can be increased, cost reduced, and quality improved in different plants is available from Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. The bulletins cover the following subjects: (Bulletin No. 101) "Cutting four gears in 33 seconds each" and "Cutting gear finishing time in half on truck gears"; (Bulletin No. 102) "Form tools cut machine time on pump gears 90 per cent"; (Bulletin No. 103) "One machine does work of 15 hobbers on toothed ratchet lock in an automatic transmission"; (Bulletin No. 104) "Using gear finishing effectively on job-lot quantities of gears"; (Bulletin No. 105) "Cutting costs by form cutting precision gears"; (Bulletin No. 106) "Quality control boosts gear plant business"; (Bulletin No. 107) "Production line shaving of heavy duty gears"; (Bulletin No. 108) "One machine doubles output of gears for washing machines"; (Bulletin No. 109) "More tractor gears at lower cost"; and (Bulletin No. 110) "Versatility key to gear production at Caterpillar."

"**Liqui-Jector**" for the continuous, automatic cleaning of large volumes and high pressures of compressed air and other gases contaminated with water, free oil, water-oil emulsions, and dirt is described in a bulletin available from Selas Corporation of America, Philadelphia 34, Pennsylvania.

The "MIGHTY MIDGET" Line

ORDER DIRECT on our 10 day money back guarantee.

RADIUS DRESSER \$34.00

Diamond \$7.00



Hardened shaft—Bearing adjustable for wear. Diamond always perfectly centered. Easily set adjustable 180° stops.

10" Wheel size for DoALL and NORTON Grinders—\$39.00. Diamond \$7.00.

SPECIAL 14" Wheel Size \$89.00.

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Please Send D.O. No. with Order, when possible.

ANGLE DRESSER \$39.00

Diamond
\$7.00

Special Size
Angle and Radius
Dressers Made
to Order.
Send for
Quotation.



First low cost
high precision
Angle Dresser on the Market. Can be set very
accurately with a Protractor. Works underneath
the wheel. Large bearing surfaces.

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DIVIDING HEADS



Catalog
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3 SIZES — 4 MODELS — 6" to 12"
CARROLL DIVIDING HEAD CO.

3525 Cardiff Ave., Cincinnati 9, Ohio

THE MURPHY PISTOL SPRAYER
INDISPENSABLE IN
ANY SHOP

No limit to work it will do.
Takes place of brush and
spray can for blackening
mold. Blackening is driven
into pores of sand or loam
by air pressures. Thus it stays
on and peels the casting bet-
ter. Once tried, always used.
Write for catalog.

Jas. A. Murphy & Co., Inc.
1421 High St. Hamilton, O.

Murphy
Pistol Sprayer



Hamilton Spray Gun

VERNIER CALIPERS

IMPORTED FROM GERMANY

6" with 1/128" and MM reading @ \$ 8.25 each

6" with 1/128" and .001" reading @ \$ 9.75 each

12" with 1/128" and .001" reading @ \$37.50 each

CUTTING TOOL CATALOG ON REQUEST.

Dealers' inquiries invited.

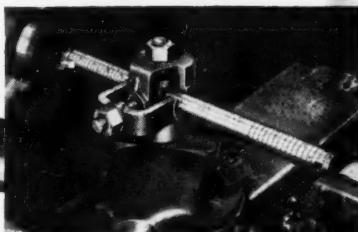


Masters Precision Tools

3613 ARCHER

CHICAGO 9, ILL.

**NO MORE
OF THIS!**



GLOBE BORING BAR HOLDERS

maintain true bore alignment

GLOBE offers the facility of changing boring sizes or extending bars *without unclamping the holder*. Once set, true alignment of bar with bore is positively maintained no matter how often the bar set-up is altered! GLOBE'S exclusive, independent clamps on Bar and Body provide the answer!

GLOBE also gives you Self-Centering of Cutter Bits, Calibrated Boring Bars, Less Chatter... *ALL for LESS MONEY!*

6 HOLDER SIZES, 12 BAR SIZES
Write for literature or order
through your dealer!

GLOBE
HEAT-SEAL, INC.
MACHINE TOOL DIVISION

3384 Robertson Boulevard, Los Angeles 34, California

Precision Holding Tools. Erickson Tools, Division of The Erickson Steel Co., 2303G Hamilton Ave., Cleveland 14, Ohio, has issued Catalog "J" covering its line of precision holding tools, including precision collet chucks, adjustable and full floating holders, precision tap chucks, air-operated speed chucks and air cylinders, precision expanding mandrels, speed indexers, and various boring and reaming tools.

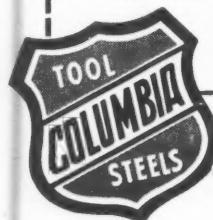
Columbia

Tool Steels for ALL TOOLS FOR ALL PURPOSES CARBON GRADE:

Special, Extra, Extra Header
Die, Waterdie Extra, Vanadium Extra, Standard

**COLUMBIA TOOL
STEEL COMPANY**

Main Office & Works
Chicago Heights 6, Ill.



Regent LIVE Centers

with the "FREE-TURNING POINT"

- ACCURACY .0001 • VERY RIGID
- SHORT OVERHANG
- FREE TURNING • SMALL HEAD

Light Duty and Precision Small Parts Work call for the light, free-turning action of the Regent Live Center. If your dealer cannot supply you, write us direct. Descriptive bulletins on request.

Machine Shop Equipment. Center Tool Co., 151 Centre St., New York 13, N. Y., is offering to purchasing agents and other machine shop executives a 240-page catalog, together with price list, on a complete line of machine shop equipment, including taps, dies, collets, gages, die holders, tap extractors, drills, bits, reamers, screw extractors, countersinks, centers, end mills, arbors, lathe mandrels, center keys, hollow mills, milling cutters, gear cutters, keyseat cutters, saws, end mill holders, sleeves, counterbores, dividing heads, drill chucks, vises, tool bits, carbide-tipped standard tools, shims stock, hole cutters, grinding fixtures, toolholders, sockets, wrenches, clamps, dogs, calipers, micrometers, scales, dividers, parallels, indicators, punches, knurls, V-blocks, verniers, drill rods, tool chests, portable electric drills, sanders, bench grinders, milling attachments, cross slides, squaring shears, power presses, chucks, adapters, demagnetizers, sprayers, turret tool posts, tapping attachments, boring heads, stamps, die layout materials, belt lacing equipment, soldering irons, set and cap screws, bolts, dressing tools, band sawing machines, band saw blades, oilers, pliers, files, surface plates, angle irons, hammers, screw drivers, and other items.

Thread Inserts. A 16-page two-color bulletin (No. 650-R) containing design data on helical-wire thread inserts and the use of these inserts in the protection and repair of tapped holes is now being offered by Heli-Coil Corp., 47-23 35th St., Long Island City 1, N. Y. Detail drawings and text explain how the inserts are used as original manufacturing components to protect tapped threads in aluminum, magnesium, plastics, iron, steel, and wood against stripping, wear, corrosion, seizing, and galling. Also covered are uses of the inserts in production salvage and maintenance operations.

MORSE TAPER	A	B	C	D	E	F	G	LOAD AT 100 R.P.M. RADIAL THRUST
1	3-3/16	1-1/32	3/4	2-1/8	475	5/8	1-1/2	480 lbs 480 lbs
2	3-5/8	1-1/32	3/4	2-9/16	700	5/8	1-1/2	480 lbs 480 lbs
3	4-1/4	1-1/32	3/4	3-3/16	938	5/8	1-1/2	480 lbs 480 lbs

ROYAL PRODUCTS
89 UNION STREET, MINEOLA, N.Y.

EXTRA LONG LENGTH HIGH SPEED DRILLS

Immediate Delivery



Straight Shank No. 1 - 60

No. By Gage	Length Inches	Our Price Net Each	Size Inches	Length Overall Inches	Length Flute Inches	Price Each Net
1 to 10	6 1/4	\$1.00	13/32	12	9	\$3.05
11 to 20	5 3/4	.90	27/64	12	9	3.30
21 to 30	5 5/8	.80	29/64	12	9	3.60
31 to 40	5 1/4	.70	15/32	12	9	3.60
41 to 50	4 1/2	.60	31/64	12	9	3.60
51 to 60	3 1/2	.50	1/2	12	9	3.60

Straight Shank

Size Inches	Length Overall Inches	Length Flute Inches	Price Each Net	17/32	15	12	\$7.15
1/8	12	9	\$1.65	19/32	15	12	8.25
9/64	12	9	1.65	5/8	15	12	8.80
5/32	12	9	1.65	21/32	15	12	9.00
11/64	12	9	1.65	11/16	15	12	9.10
3/16	12	9	1.65	23/32	15	12	9.35
13/64	12	9	1.76	3/4	15	12	9.50
7/32	12	9	1.76	25/32	15	12	10.50
15/64	12	9	1.95	13/16	15	12	12.00
1/4	12	9	1.95	27/32	15	12	12.65
17/64	12	9	2.05	7/8	15	12	13.20
9/32	12	9	2.05	29/32	15	12	13.75
19/64	12	9	2.25	15/16	15	12	14.30
5/16	12	9	2.25	31/32	15	12	15.40
21/64	12	9	2.50	1	20	15	17.60
11/32	12	9	2.50	1-1/16	20	15	18.70
23/64	12	9	2.75	1-1/8	20	15	19.80
3/8	12	9	2.75	1-3/16	20	15	22.00
25/64	12	9	3.05	1-1/4	20	15	24.00

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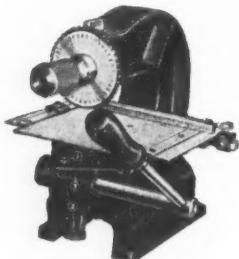
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Gage Blocks. A wire bound catalog containing complete information on Webber Micro-Matic Gage Blocks has been prepared by Webber Gage Co., 12899 Triskett Rd., Cleveland 11, Ohio. The catalog is divided into sections that cover the manufacture of gage blocks, physical characteristics, gage block fixtures, angle gage blocks, and angle gage block applications. Included are information on gage block care and an outline of an acceptable method for combining gage blocks to fit a given dimension.

Rotary Work Feed Table for the fast, safe, economical feeding of workpieces to machine tools is fully illustrated and described in a 12-page three-color bulletin (No. T-80) prepared by The Bellows Co., Dept. MMS, 222 W. Market St., Akron 9, Ohio. The bulletin discusses in detail all parts of the table and includes installation photographs, dimensional drawings, and specification data, as well as wiring diagrams and electrical hookups for combining the table with other Bellows pneumatic devices.

Universal Die System. Connecticut Tool & Engineering Co., 544 Iranistan Ave., Bridgeport 5, Conn., has published a 40-page booklet illustrating and describing the Williams Universal Die System which is said to provide for maximum economy in the manufacture of dies for metal stampings. Complete information on the three major standardized units comprising the system is presented, together with instructions and drawings for use in laying out dies. Prices of all standard items in the system are listed on a separate price sheet enclosed with the booklet.

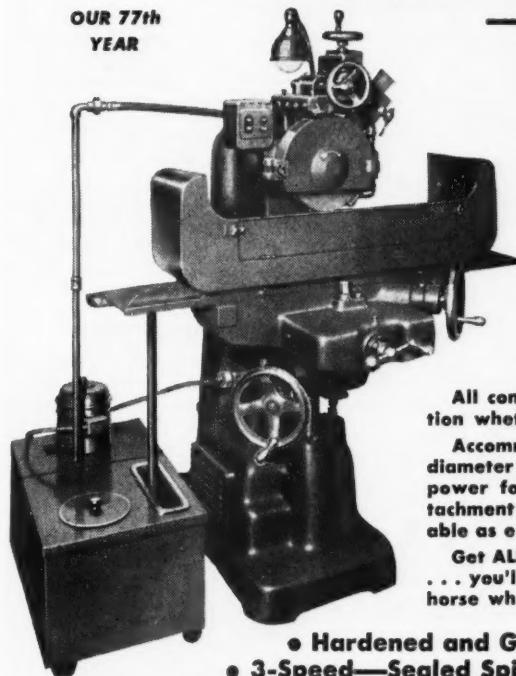
Metal Cutting Tool Stock List. Availability of a 44-page completely illustrated stock list and price list has been announced by Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill. Wherever applicable, tools listed are in accordance with the latest A.S.A. Standards. An interesting feature of the booklet is its stock list feature providing buyers with exact inventory information on quantities available for immediate delivery. To keep this information current, the listing will be revised and re-issued quarterly. All prices are printed in color to facilitate discount reference. In addition to new milling cutters in accordance with A.S.A. Standard B5.3—1950, spur gear shaper cutters, both 20-degree p.a. and 14½-degree p.a., are listed.

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Let's be realistic in our approach to the employment problems of the physically handicapped.

The blunt truth is that few jobs in any shop, office, or factory require so-called physical perfection. The handicapped can be employed in most jobs.

Two Nation-wide surveys of the work performance of the physically handicapped, in industries both light and heavy, assure us that the handicapped, when properly placed, generally make good. They are excellent producers. They are safe workers. They stay on the job.

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Think these facts over, as the Nation observes National Employ the Physically Handicapped Week, October 7-13. Think them over in the light of the growing manpower needs of our defense production program. To fail to employ the physically handicapped in jobs for which they are qualified doesn't make sense. We cannot afford, in this hour of national crisis, to waste our manpower.

Numbers shown are page numbers in this issue

— A —

Abrasive Grain, Cloth, Paper, Discs, Belts, Stones, Etc., 33, 50, 55, 187, 198, 207, 213, 321, 383, 398
Absorbents, Oil and Grease, 302
Accumulators, 104, 105
Adapters, 413
After Coolers, 412
Air-Operated Equipment (Look for specific item)
Air Separators, 412
Angles, 214, 242, 359, 413
Arbors, 277, 343, 365, 405

— B —

Backstands, 198
Bags, Industrial, 273
Balancing Machines, 176 A, B, C, D
Balancing Ways, 357
Bar Feeds, Pneumatic, 79
Bar Stock, 364
Bases, Index, 42
Bases, Machine, 80, 341
Bearings, Ball, 58
Bearings, Bronze, 58, 255
Bearings, Thrust, 327
Belting, V, 332
Bending Machines, 8, 9, 36, 154, 174, 345, 383
Bins, 194
Bits, 277, 291
Blades, Carbide, 85
Blades, Centerless Grinder, 364
Blades, Cutting-Off, 284
Blocks, Magnetic, 373
Blocks, Step, 373, 397
Blocks, Tool, 337
Blowers, 337
Bolts, 115, 373
Boosters, 104, 105
Boring Bars, 203, 322, 331, 407
Boring, Drilling and Milling Machines, Horizontal, 75
Boring, Drilling and Tapping Machines, Multiple, 22, 82
Boring Heads, 226, 322, 365, 433
Boring Machines, Second Cover, 75, 336
Boring Mills, Horizontal, 39
Boring Mills, Universal, 75, 401
Boxes, Shop, 308
Brakes, Press and Pending, 129, 248
Brazing Equipment, 261
Broaches, First Cover, 56, 57, 349
Broaching Fixtures, First Cover, 349
Broaching Machines, 8, 9, 43, 56, 57
Bronze Bars, 255
Brushes, Wire Wheel, 109
Buffers, Portable Electric, 145

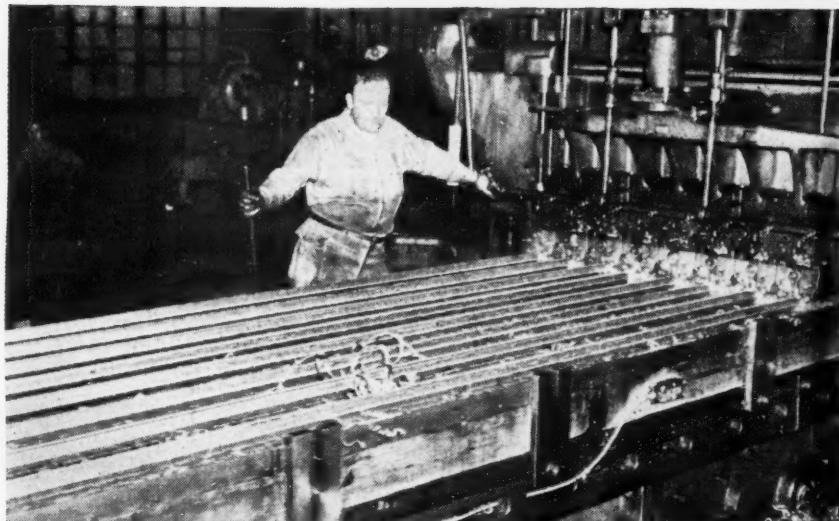
Buffers, Portable Pneumatic, 145

Buffing Machines, 76, 435, 436
Bushings, Drill Jig, 176, 182, 312, 328, 341, 364, 368
Bushings, Sleeve, 255, 338, 364

— C —

Calipers, 353, 371, 407
Cams, 333, 341, 345, 363, 412
Carbides, 66, 67, 364, 371
Centers, Bench, 153
Centers, Lathe, Planer, Miller, Etc., 232, 277, 363, 377, 379, 388, 393, 408
Chains, 58, 253
Chamfering Machines, 36
Checking Rolls, 357
Chuck and Indexing Fixtures, 359, 413
Chucking Machines, Automatic, 27
Chucks, Air, 245, 413
Chucks, Boring, 292
Chucks, Collet, 96, 160, 357
Chucks, Diaphragm, 297, 413
Chucks, Internal, 230
Chucks, Lathe, 160, 305
Chucks, Magnetic, 110, 283, 305, 413, 417
Chucks, Tap, 291
Chucks, Universal, 94, 305
Clamps, 304, 306, 333, 361, 392, 397
Clamps, Air, 386
Cleaners, Metal, 52, 53
Cleaners, Vacuum, 339
Clutches, 333, 412
Collars, 373
Collet Closers, 323
Collets, 295, 389
Comparators, 6, 391
Compressors, Air and Gas, 38
Controlling Devices, 121, 386
Coolants, 218
Coolant Separators, 205
Coolant Units and Systems, 107
Counterbores, 137, 251, 277, 343, 431
Countersinking Machines, 360
Countersinks, 277, 385
Couplings, Flexible, 58, 253
Cross Slides, 323, 375
Cubes, 413
Cut-Off Machines, 20, 36, 229, 391, 395, 427, 436
Cut-Off Wheels, 337
Cutter Sharpening Machines, 8, 9
Cutters, Hole, 362
Cutters, Milling, 60, 117, 137, 173, 200, 235, 243, 251, 379, 395
Cutters, Engraving, 389
Cylinders, Counterbalance, 104, 105
Cylinders, Hydraulic and Pneumatic, 104, 105, 245, 425

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— D —

Deburring Machines, 36
Demagnetizers, 305
Diamond Compounds, 398
Diamond Powders, 398
Diamond Wheels, 50, 363
Diamonds and Diamond Tools, 31, 345
Die Feeds, 106, 363, 369
Die Fillers, 184
Die Heads, Threading, 2
Die Making Machines, 63
Die Sets, 37, 161, 247
Diemakers' Supplies, 161
Dies, 4, 15, 113, 175, 235, 251, 354, 364, 421
Dividing Heads, 153, 305, 413
Drawing Compounds, 52, 53
Dressing Fixtures, Grinding Wheel, 83, 84, 292, 342, 406, 413
Dressing Tools, 345
Drill Heads, 44, 236, 346, 374, 396, 433
Drilling and Tapping Units, 100, 267
Drilling Machines, Bench, 44, 118, 119, 279, 323, 395
Drilling Machines, Duplex, 360
Drilling Machines, Horizontal, 93, 336
Drilling Machines, Multiple Spindle, 44, 75, 93, 336, Third Cover
Drilling Machines, Radial, 14, 39, 44, 73, 80, 131, 279
Drilling Machines, Unit Type, 20, 21
Drilling Machines, Vertical, 14, 20, 21, 44, 75, 93, 100, 131, 193, Third Cover
Drilling Units, 325, 372
Drills, Center, Core, Twist, Square, Etc., 28, 29, 137, 207, 217, 235, 251, 277, 343, 377, 409
Drills, Portable Electric, 48, 49, 436
Drives, 332, 431
Drives, Motor, 201, 378, 393
Drums, Grinding, Sanding, Etc., 109
Dust Control Equipment, 3, 112, 298, 303, 436

— E —

Engines, Diesel, 38
Engraving Machines, 228, 387
Etchers, 196, 335

— F —

Facing Heads, 226
Fastener Units, 380
Feed Units, 386
Files, 24, 25, 169, 321, 395
Files, Band, 107, 111, 215
Files, Rotary, 15, 109
Filing Machines, 329
Filters, 349
Flame Hardening Apparatus, 8, 9
Flexible Shaft Equipment, 15
Floater, Sheet, 394
Floats, 365
Furnaces, Heat-Treating, 61, 225, 294, 296, 329, 345, 355, 397

— G —

Gage Blocks, 111, 263
Gage Handles, 212

Gages, 54, 101, 107, 111, 135, 155, 263, 297, 301, 312, 347, 383
Gear Checking Instruments and Machines, 221
Gear Cutting Machines, 46, 47
Gear Measuring Instruments and Machines, 263
Gears and Gear Units, 5, 58, 221, 265, 269, 397
Greases, 52, 53
Grinders, Abrasive Band and Disc, 324
Grinders, Abrasive Belt, 75, 76, 203, 213
Grinders, Air, 145, 170, 349
Grinders, Bench, 7, 74, 435, 436
Grinders, Carbide Tool, 76
Grinders, Centerless, 8, 9, 26
Grinders, Cutter and Tool, 63, 75, 76, 281, 389, 411, 435
Grinders, Cylindrical, 8, 9, 435
Grinders, Disc, 17, 435
Grinders, Drill, 63, 75, 133, 349, 411, 435
Grinders, Face Mill, 63
Grinders, Internal, 351
Grinders, Jig, 83
Grinders, Pedestal, 238, 435, 436
Grinders, Portable and Tool Post, 435, 436
Grinders, Portable Electric, 48, 49, 109, 145, 436
Grinders, Profile, 89, 184
Grinders, Semi-Automatic, 40, 41
Grinders, Snagging, 435
Grinders, Surface, 59, 107, 111, 191, 207, 285, 351, 402, 411, 419
Grinders, Swing Frame, 381
Grinders, Valve, 211
Grinding Fixtures and Attachments, 275, 311, 323
Grinding Wheels, 50, 103, 187, 218, 219, 358
Guns, Air, 407

— H —

Hand Tools, Power (Look for specific item)
Handles, Hammer, 359
Handles, Machine, 242, 373
Handwheels, 242, 373
Hardness Testing Devices, 95, 314
Heating Units, 72
Hinges, 130, 371
Hobbing Machines, 197
Hobs, 137, 235, 251
Hoisting and Conveying Machinery, 104, 105
Holders, Bit, 291
Holders, Boring Bar, 331, 407
Holders, Grinding Wheel, 88
Holders, Indicator, 381
Holders, Tap, 290, 319
Holders, Tool, 62, 122, 243, 284, 290, 299
Holders, Type, 354
Hones, 340
Honing Fixtures, 307
Honing Machines, 307, 336, 340
Hydraulic Equipment (Look for specific item)

— I —

Indexing Heads, 343
Indicators, 155, 309, 327, 377
Iron Working Machines, 32

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— J —

Jig Borers, 14, 83
Jigs and Fixtures, 80, 93, 242, 297
Joints, Universal, 58, 291, 337, 378

— K —

Keys, Machine, 353, 365
Keys, Socket Screw, 115
Keys, Woodruff, 353, 365
Keyway Cutting Machines, 381
Knees, Toolmakers, 359
Knives, 24, 25, 155, 215
Knobs, Machine, 242, 337, 373

— L —

Lapping Compounds, 398
Lapping Machines, 8, 9, 40, 41
Lathes, Automatic, 23, 34, 86, 87, 176 A, B, C, D
Lathes, Bench, 74, 193, 317, 323, 367
Lathes, Engine and Toolroom, 12, 13, 33, 51, 73, 86, 87, 91, 149, 157, 193, 246, 320, 367, 391, 401
Lathes, Speed, 158, 436
Lathes, Spinning, 44
Lathes, Turret, 27, 99, 331, 413
Lathes, Vertical Turret, 65
Layout Materials, 180, 342, 362, 387
Levers, 373
Lifters, Sheet, 159
Light Wave Measuring Equipment, 263
Lighting Equipment, 188, 356, 381, 387
Lubricants, 52, 53, 335, 341
Lubricators, 349

— M —

Magnifiers, 168, 412
Mandrels, Expanding, 343, 365
Marking Machines, 208, 357, 421
Micrometers, 155, 263, 371, 383
Milling Attachments, 153, 311, 323, 330, 433
Milling Fixtures, 283
Milling Machines, Automatic, 189
Milling Machines, Bench, 74, 330, 382
Milling Machines, Hand, 189, 237, 330
Milling Machines, Horizontal, 8, 9, 75, 195
Milling Machines, Turret, 433
Milling Machines, Universal, 8, 9, 75, 195
Milling Machines, Vertical, 8, 9, 11, 75, 195, 387, 389
Mills, End, 90, 137, 251, 343, 347, 366
Mills, Face, 85, 92
Mills, Hollow, 343
Mills, Rolling, 45
Molds, Hammer, 359
Motors, 112, 199
Mounted Points and Wheels, 109
Mountings, Machine, 231

— N —

Nails, 177
Nibblers, 339, 367, 375
Notching Machines, 118, 119
Notching Units, 118, 119

Numbering Heads, 421
Numbering Machines, 410
Nut Setters, Portable Electric, 436
Nuts, 89, 337, 348
Nuts, T, 337, 397

— O —

Oil Groovers, 166, 351
Oilers, 351
Oils, Cutting, 8, 9, 52, 53, 163, 190
Oils, Quenching, 52, 53

— P —

Pantographs, 98, 387
Parallels, 214, 242, 359, 373
Partitions, 405
Parts, Machine, Aircraft, Production, Etc., 269, 297, 351, 353
Penetrators, Steel Bar, 314
Pillow Blocks, 58
Pins, 343, 348, 353, 365
Pins, Stop, 206
Pipe and Stud Extractors, 299
Planers, 75, 401
Plates, Angle, 359, 413, 381
Plates, Lapping, 359
Plates, Machinery, 387
Plates, Screw, 113, 175, 235
Plates, Surface, 18, 19, 214, 227, 242, 359, 413
Plugs, Pipe, 115
Pointers, Bar, 360
Polishers, Portable Electric, 145, 349
Polishers, Portable Pneumatic, 145
Polishing Bands, 145
Polishing Machines, 76, 435
Polishing Wheels, 35
Power Units, Hydraulic, 245
Positioning Devices and Machines, 14, 306
Presses, Air, 245, 386
Presses, Arbor, 365
Presses, Forging, 108
Presses, Hydraulic, 44, 108, 245, 287
Presses, Power, 45, 75, 146, 186, 339, 357, 363, 400, 412
Presses, Punch, 64, 216, 382, 400
Presses, Sub, 350
Profiling Machines, 389
Pulleys, 332
Pumps, Coolant and Lubricant, 245, 389, 429
Pumps, Air, 112
Pumps, Vacuum, 38
Punch Press Feeds, 106, 363, 369
Punch Press Sets, 337
Punches, 327, 352
Punching Machines, 33, 118, 119
Punching Units, Hole, 118, 119

— R —

Racks, Bar and Tube, 172
Racks, Machine, 365
Racks, Storage Bin, 194
Ratiomotors, 58
Reamers, 28, 29, 68, 113, 137, 138, 139, 207, 235, 251, 277, 343, 347, 353

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Rectifiers, 305
Reels, Stock, 106, 325, 403
Regulators, 225, 349
Rests, 323
Riveting Machines, 344, 351, 367
Rivets, 177
Rolls, 364
Rolls, Bending, 33
Router, 436
Rust Preventives, 52, 53, 335

— S —

Safety Equipment, Press, 329, 373
Sandblast Equipment, 112
Sanders, Portable Electric, 145
Sanders, Portable Pneumatic, 48, 49, 145
Saw Blades, Band, 16, 24, 25, 69, 101, 107, 111, 155, 167, 209, 215, 393
Saw Blades, Circular, 24, 25, 249, 343
Saw Blades, Hack, 24, 25, 69, 155, 167, 209, 215
Saw Blades, Hole, 69, 313
Saw Sharpening Machines, 152, 310
Sawing Machines, Band, 16, 44, 101, 111, 120, 244, 329
Sawing Machines, Circular, 75, 114, 391
Sawing Machines, Friction, 33
Sawing Machines, Hack, 239, 278, 305
Saws, Portable Electric, 48, 49
Scrapers, Hand and Power, 357
Screw Drivers, Hand, 291
Screw Drivers, Portable Electric, 48, 49, 435
Screw Extractors, 227
Screw Machines, Automatic, 82, 413
Screws, Cap, Set, Socket and Machine, 117, 291, 326, 337, 348, 360, 385, Fourth Cover
Screws, Lock, 115
Screws, Transfer, 359, 377
Services: Milling, Grinding, Lapping, Rebuilding, Repairing, Business, Etc., 269, 334, 341, 399, 412, 414
Shapers, 44, 102, 129, 149, 193, 401
Sharpening Fixtures, 397
Shear, Punch and Coppers Combination, 33
Shearing Machines, 33, 118, 119, 129
Shears, Portable Pneumatic, 399
Shears, Squaring, 24, 25
Shims, 361
Sleeves, 277, 338
Slotting Heads, 153, 311
Slotting Machines, 75, 360
Sockets, 277
Soldering Materials, 390
Spacing Collars, Arbor, 148, 405
Special Machinery, 75, 76, 82, 100, 114, 176 A, B, C, D, 226, 236, 242, 396
Speed Reducers, 58, 178
Spindles, 183, 351, 413
Spot Facers, 343
Spotters, 357
Sprockets, 58, 253, 265
Staking Machines, 344
Stamps, 354, 361, 369, 400, 421
Steel, Die, 24, 25
Steel, General Purpose, 423
Steel Stock, Ground Flat, 24, 25, 69, 101, 155

Steel, Tool, 70, 71, 107, 111, 271, 408
Step Block Sets, 337
Stock Stands, 106, 325
Stops, Die Feed, 192
Stops, Finger, 206
Straightedges, 214, 359
Studs, 337, 348
Stud Sets, 337, 397
Stud Setters, 291
Superfinishing Machines, 176 A, B, C, D
Surfacing Machines, Abrasive, 44
Switches, 305

— T —

Tables, Elevating, 159
Tables, Rotary and Index, 30, 39, 100, 153, 324, 333, 379, 413
Tap Extractors, 299
Taper Attachments, 373
Tapes, 321, 383
Tappers, Portable Electric, 436
Tapping Heads, 15, 93, 319, 346, 374, 403
Tapping Machines, 27, 77, 93, 100, 336
Tapping Units, 15, 100, 267, 325
Taos, 15, 113, 136, 155, 175, 207, 235, 251, 254, 343, 384
Thread Checking Instruments, 6
Threading Machines, 2, 36, 78, 81, 330
Tool Bits, 60, 343
Tool Blanks, 355, 395
Tool Cribs, 405
Tool Stands, 48, 49
Tools, Boring, 252, 369
Tools, Bottoming, 252
Tools, Carbide, 66, 67, 85, 173, 235, 277, 334, 364, 395
Tools, Cutting-Off, 249
Tools, Deburring, 376
Tools, Facing, 252, 369
Tools, Form, 173, 235, 343
Tools, Honing, 307
Tools, Recessing, 252
Tools, Special, 75, 97, 137, 242, 251, 275, 277, 343, 347, 421
Tools, Threading, 252, 369
Tools, Turning, 60
Traps, Air and Steam, 365
Turrets, Drill, 171
Turrets, Lathe, 375, 176 A, B, C, D

— V —

Valves, 245, 365, 386, 425
Vises, Bench and Machine, 128, 132, 153, 161, 305, 306, 346, 359, 367, 373, 386, 389, 393, 399, 406, 413, 433

— W —

Welding Equipment and Supplies, 185, 233, 385
Wires, Measuring, 263
Wrenches, 175, 291, 355, 370
Wrenches, Portable Pneumatic, 38



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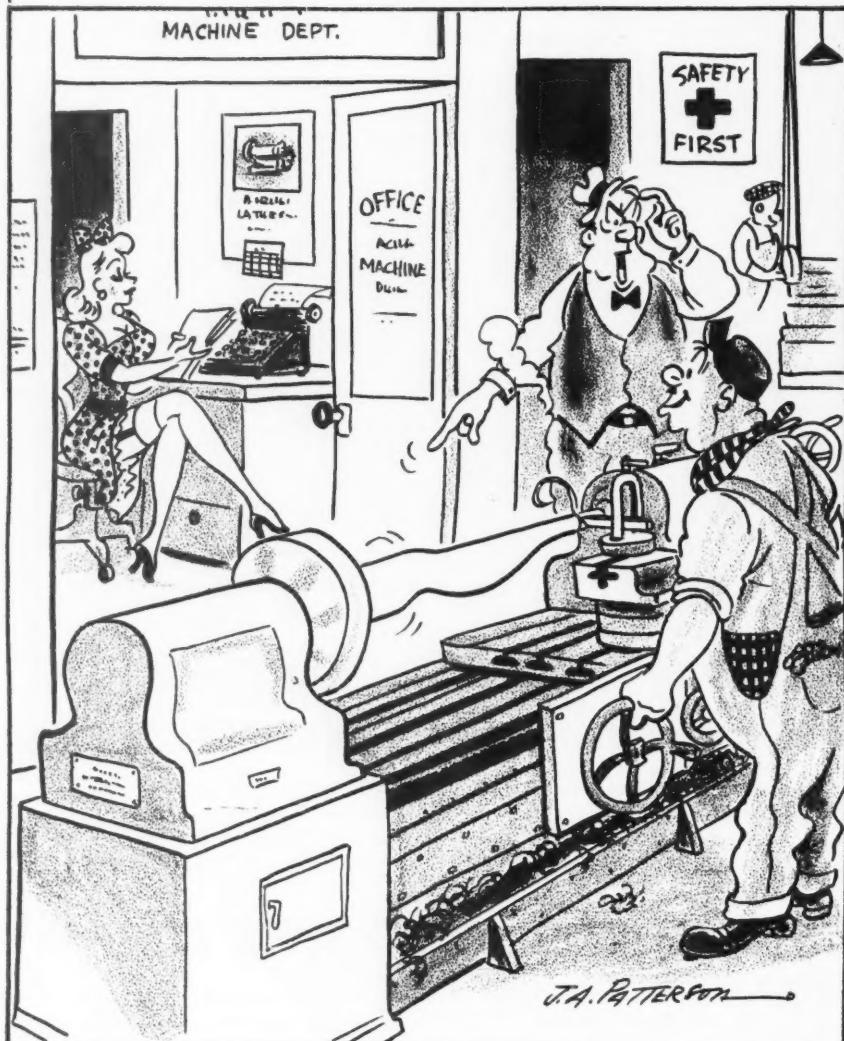
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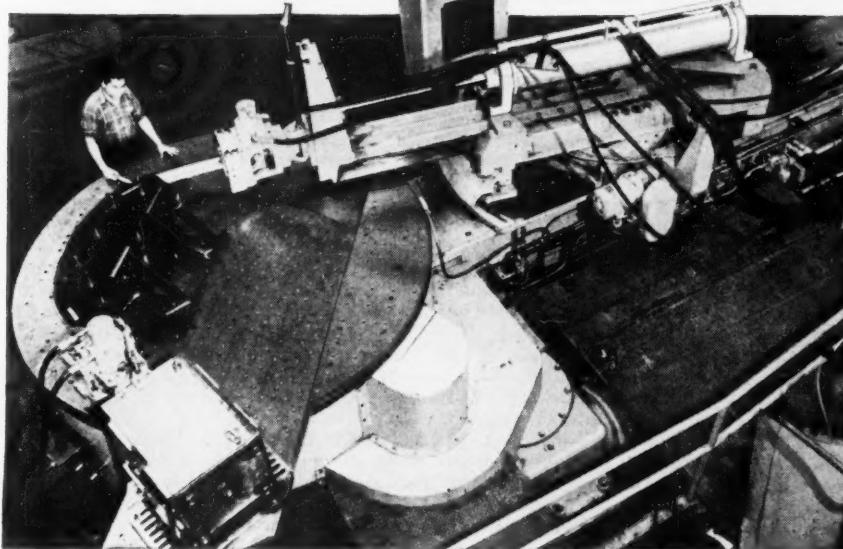
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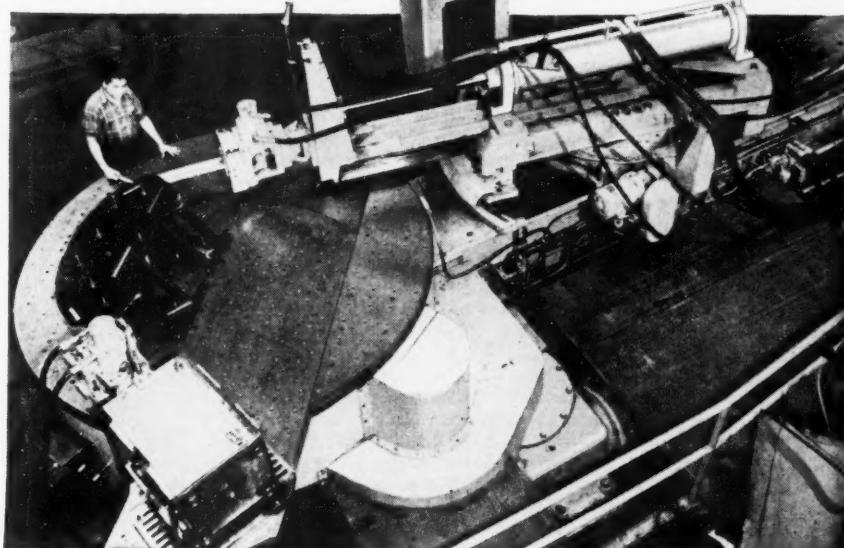
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Over The Editor's Desk

Investment In Peace

THE World Metallurgical Congress which is being held in Detroit this month will have a particular significance for those who have begun to doubt the practicability of cooperation on an international scale. The discouraging tensions and bickerings that usually mark meetings conducted at high political levels will be absent when the more than 500 top-ranking scientists and engineers from the free nations of Europe, Africa, and Asia, as well as from North and South America, gather together for the purpose of exchanging technical information. Divergent political opinions will be subordinated to the all-important problem of increasing production in the free countries of the world.

Such notables as Dr. Pierre Coheur, Director of the National Center for Metallurgical Research, Liege, Belgium; Dr. Howard Knox Worner, Professor of Metallurgy, University of Melbourne, Australia; Hubert F. O. Hauttmann, Manager of Research for United Austrian Iron and Steel Works, Linz, Austria; Dr. G. P. Contractor, Acting Director of National Metallurgical Laboratory, Bombay, India, are typical of the caliber of men who will be present at this Congress.

Voices have been raised in some quarters as to the wisdom of bringing to this country engineers who will take home with them information which will enable them to increase the level of their production to a point where they will be competing with us not only here in our own country but also in countries into which we export. The blunt truth is that we have no choice. If we don't help our allies to increase their own production, we will have to furnish them with the things they so desperately need—and probably at the tax-payers' expense. The value of the American industrial know-how that finds its way into the plants of our friends throughout the world can only be measured in the remote future. It is hoped, and there are reasons to believe, that when our friends do become self-sustaining, they will continue to cooperate with us.

Again, too often, we here in America overlook the fact that many of the ideas which we have adapted to mass production methods were actually originated by a foreign engineer or scientist. Central Europe, for example, has long been recognized as the cradle of fundamental research from which has come so many of the things which we know and enjoy today.

Many industrial organizations in this country long ago discovered that when they threw open their doors to inspection by others they in return received more useful information than they imparted. Those who aren't willing openly to discuss their production methods with others soon discover that what they had assumed to be their own deep secrets have either been by-passed or supplanted by improved techniques. In a wave of advancing progress, they are left standing by the wayside. We have yet to find the window which, when it is opened, does not permit more light to come in than goes out.

In Detroit, this month, many windows will be opened. Through these windows will come light on technical problems that will foster a better understanding between peoples of different nationalities. It will be the type of understanding which eventually may percolate through to the highest political levels.



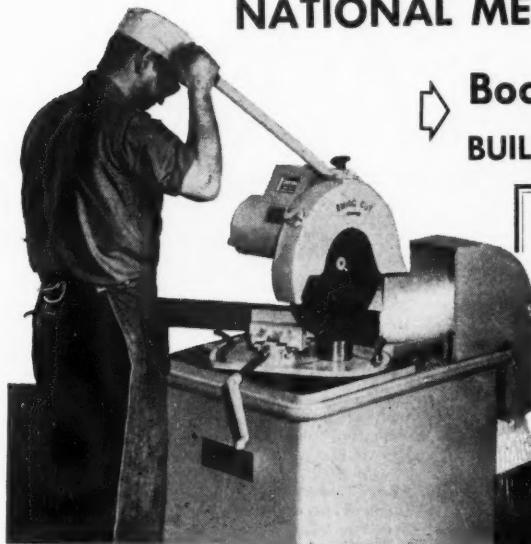


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INDEX TO ADVERTISEMENTS

—A—

Aber Engr. Works, Inc.	200
Ace Abrasive Laboratories	398
Ace Drill Bushing Co.	341
Acme Industrial Co.	182
Acme Tool Co.	359
Acme Wire & Iron Works	406
Acorn Bearing Co.	327
Aeromark Co.	208
Adamas Carbide Co.	371
Adams Co.	265
Aget-Detroit Co.	298
Albertson & Co., Inc.	211
Allegheny Ludlum Steel Corp.	70, 71
Allen Co., A. K.	379
American Chain & Cable Co., Inc.	404
American Drill Bushing Co., Inc.	328
American Gas Furnace Co.	329
American Non-Gran Bronze Co.	414
American Pipe Bending Machine Co., Inc.	174
American Saw & Mfg. Co.	69
American Tool Works Co.	73
Ames Co., B. C.	309
Anderson Bros. Mfg. Co.	357
Apex Machine & Tool Co.	291
Armour & Co.	198
Armstrong-Blum Mfg. Co.	16
Armstrong Bros. Tool Co.	122
Atlantic Gear Works	397
Atlantic Saw Mfg. Co.	293
Auto Engraver Co., Inc.	387
Auto Moulding & Mfg. Co.	371
Automatic Steel Products, Inc.	77
Avey Drilling Machine Co.	100, 324, 325

—B—

Baker Bros., Inc.	Third Cover
Baldor Electric Co.	7
Barber-Colman Co.	138, 139
Barnaby Mfg. Co.	62
Barnes Co., Inc., W. O.	167
Barnes Drill Co.	205
Bartelt Engr. Co.	383
Bay State Tap & Die Co.	254
Behr-Manning, Div. of Norton Co.	321
Benchmaster Mfg. Co.	382
Besly & Co., Chas. H.	207
Beverly Shear Mfg. Co.	399
Blair Tool & Machine Corp.	345

Blanchard Machine Co.	88
Bliss Co., E. W.	45
Bloomfield Tool Corp.	333
Boston Gear Works	58
Boyar-Schultz Corp.	191
Boye & Emmes Machine Tool Co.	246
Brewster-Squires Co.	335
Bridgeport Machines, Inc.	433
Brighton Screw & Mfg. Co.	326
Brown Engr. Co.	172
Brown & Sharpe Mfg. Co.	90
Buck Tool Co.	96
Buckeye Brass & Mfg. Co.	255
Buckeye Tools Corp.	94
Buffalo Dental Mfg. Co.	337
Buffalo Forge Co.	32
Bullard Co.	65
Burke Machine Tool Co.	330
Busch Co., J. C.	214
Butterfield Div.	113

—C—

Campbell Div., Andrew C.	404
Capewell Mfg. Co.	215
Capitol Mchry. Corp.	279
Carboloy Dept., General Electric Co.	66, 67
Carborundum Co.	187
Card Mfg. Co., S. W.	175
Carlton Machine Tool Co.	80
Carroll Dividing Head Co.	407
Carroll & Jamieson Machine Tool Co.	320
Chandler Tool Co.	226
Chicago Latrobe Twist Drill Works	277
Chicago Pneumatic Tool Co.	38
Chicago Screw Co.	348
Chicago Tool & Engr. Co.	333
Chicago Wheel & Mfg. Co.	358
Cincinnati Bickford Tool Co.	131
Cincinnati Electrical Tool Co.	436
Cincinnati Gilbert Machine Tool Co.	39
Cincinnati Milling Machine Co.	8, 9
Cincinnati Milling Products Div., Cincinnati Milling Machine Co.	163
Cincinnati Shaper Co.	129
Circular Tool Co.	249
Clark Co., Robt. H.	362
Clark Instrument, Inc.	314
Clemson Bros., Inc.	209
Cleveland Industrial Tool Corp.	345

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Index to Advertisements

Cleveland Tapping Machine Co.	77
Columbia Tool Steel Co.	498
Comet Tool Co.	369
Commander Mfg. Co.	403
Commercial Centerless Grinding Co.	343
Comtor Co.	347
Conant Tool & Engr. Co.	349
Consolidated Machine Tool Corp.	75
Continental Machine Co.	337
Cook, Inc., L. H.	359
Cooley Electric Mfg. Corp.	345, 355
Covel Mfg. Co.	411
Criterion Machine Works	322
Crosman & Son, Inc., J. B.	351
Cross Co.	220
Crucible Steel Co. of America	271
Culiman Wheel Co.	253
Curtis Universal Joint Co., Inc.	337

— D —

D & M Guard Co.	329
Dahlstrom Mfg. Co.	192
Danly Machine Specialties, Inc.	37
Dayton Rogers Mfg. Co.	414
Dearborn, J. W.	359
Delaware Tool Steel Corp.	397
Delco Products Div., General Motors Corp.	199
Delta-Rockwell Power Tool Div.	20, 21
Denison Engr. Co.	287
Desmond-Stephan Mfg. Co.	367
Detroit Broach Co.	First Cover
Detroit Die Set Corp.	247
Detroit Reamer & Tool Co.	275
Detroit Stamping Co.	148
DeVlieg Machine Co.	203
Diversified Metal Products Co.	26
Dixon Crucible Co., Jos.	341
DoAll Co.	101, 107, 111
Donovan Mfg. Co.	399
Doyle Vacuum Cleaner Co.	339
Dreis & Krump Mfg. Co.	248
Dremel Mfg. Co.	109
Dumore Co.	133
Durant Tool Supply Co.	369
Dykem Co.	336

— E —

Eastern Centerless Grinding Co.	414
Eclipse Counterbore Co.	431
Economy Machine Products Co.	385
Economy Tool & Machine Co.	312
Edroy Products Co.	168
Eisler Engr. Co., Inc.	341
Electro-Mechano Co.	395
Enco Mfg. Co.	381
Ex-Cell-O Corp.	281

— F —

Farrel-Birmingham Co., Inc.	5
Federal Press Co.	186
Federal Products Corp.	54
Felters Co., Inc.	231
Fischer Machine Co.	166
Flynn Mfg. Co.	365
Foote-Burt Co.	47
Fosdick Machine Tool Co.	14
Fostoria Pressed Steel Corp.	356
Fulfo Specialties Co., Inc.	315
Fulmer Co., C. Allen	307

— G —

Galland-Henning Mfg. Co.	425
Gallmeyer & Livingston Co.	59
Gammons-Hoagland Co.	353
Gardner Machine Co.	17
Gelber Co.	389
General Engr. & Mfg. Co.	102
General Pattern Works	414
Gillen Co., John	353
Gisholt Machine Co.	176 A, B, C, D
Globe Products—Heat Seal Corp.	331, 407
Golconda Corp.	31
Gorton Machine Co., George	98
Govro-Nelson Co.	267
Graham Mfg. Co.	128
Grand Tool & Supply Co.	405
Grant Mfg. & Machine Co.	367
Gray Machine Co.	367
Greaves Machine Tool Co.	414
Greenfield Tap & Die Corp.	217
Greenlee Bros. & Co.	82
Greenlee Tool Co.	154
Grinders & Fixtures, Inc.	343
Grob Bros.	329
Grobet File Co. of America	385

— H —

Haas-Miller Corp.	335
Hall Mfg. Co.	357
Hamilton Tool Co.	159, 197
Hammond Mchry. Builders, Inc.	3
Hanchett Magna-Lock Corp.	110
Hanchett Mfg. Co.	310
Handy & Harman	261
Hanson-Whitney Machine Div., Whitney Chain Co.	6
Hardinge Brothers, Inc.	295
Hartford Special Mchry. Co.	81
Hartmann Mfg. Co.	132
Hassall, Inc., John	177
Heald Machine Co.	Second Cover
Heimann Mfg. Co.	377
Hendey Machine Co.	91
Herman Stone Co.	227
Heston & Anderson	320
Hevi Duty Electric Co.	225
High Speed Hammer Co., Inc.	344
Hilliard Corp.	333
Himoit Machine Co., Inc.	412
Hisey-Wolf Machine Co.	435
Hjorth Lathe & Tool Co.	367
Hoggson & Pettis Mfg. Co.	361
Holo-Krome Screw Corp.	Fourth Cover
Houghton & Co., E. F.	52, 53
Howald Machine Works, W. T.	379
Howe & Fant, Inc.	171
Huron Machine Products	212
Hutchinson Co., Wm. T.	355

— I —

Ideal Industries, Inc.	196
Ideal Tool Co.	327
Industrial Products Suppliers	361
Inter-Continental Trading Corp.	353

— J —

J & S Tool Co., Inc.	84
Jaco Devices	403

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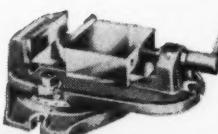
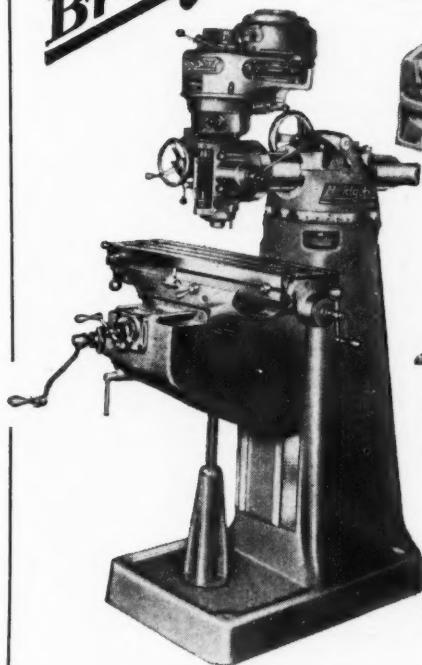
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Index to Advertisements

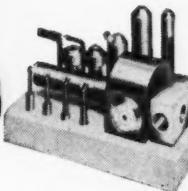
Jacobs Mfg. Co.	160	Modern Machine Tool Co.	229
Jarvis Co., Chas. L.	15	Moline Tool Co.	336
Jean Mfg. Co.	342	Monarch Machine Tool Co.	86, 87
Jefferson Engr. & Mfg. Co.	375	Montgomery & Co., Inc.	333
Jiffy Mfg. Co.	273	Moore Special Tool Co., Inc.	83
Johnson Gas Appliance Co.	294	Morey Mehry. Co.	99, 389
— K —			
Kalamazoo Tank & Silo Co.	120	Morris' Machine Tool Co.	22
Kearney & Trecker Corp.	195	Morse Twist Drill & Machine Co.	24, 25
Kempsmith Machine Co.	153	Motch & Merryweather Mehry. Co.	114
Kennametal, Inc.	395	Motor Tool Mfg. Co.	232
Kent Machine Co.	360	Mummert-Dixon Co.	381
Kester Solder Co.	390	Murphy & Co., Inc., Jas. A.	407, 412
Kling Bros. Engr. Works	33	Murphy Co., Jos. E.	395
Knight Mehry. Co., W. B.	11		
Krome, Inc.	395		
— L —			
L & J Press Corp.	146	National Machine Tool Co.	316
L-W Chuck Co.	305	National Tool Co.	97
Landis Machine Co.	2	National Twist Drill & Tool Co.	137
Lapeer Mfg. Co.	392	Nebel Machine Tool Co.	391
Lapointe Machine Tool Co.	56, 57	Neise, Karl A.	371
Last Word Sales Co.	292	New Hermes, Inc.	228
LeBlond Machine Tool Co., R. K.	12, 13	New Method Steel Stamps, Inc.	369
Lees-Bradner Co.	78	Newman Mehry. Co.	210
Leiman Bros., Inc.	112	Niagara Machine & Tool Works	161, 165
Levin & Son, Inc., Louis	323	Nichols Engr. Co.	393
Lewswaitte Machine Co., T. H.	345	Nichols-Morris Corp.	189
Lima Electric Motor Co.	201	Nicholson & Co., W. H.	365
Lincoln Electric Co.	185	Nicholson File Co.	169
Lindberg Engr. Co.	72	Nielsen, Inc.	379
Linley Bros. Co.	351	Nielsen Tool & Die Co.	359
Lipe-Rollway Corp.	79	Nobur Mfg. Co.	376
Littleford Bros., Inc.	341	Northwestern Tool & Engr. Co.	337
Locke Gage Co.	372	Norton Co.	18, 19, 35, 40, 41, 218, 219
Lodge & Shipley Co.	31	Numberall Stamp & Tool Co.	410
Logan Engr. Co.	149		
Logansport Machine Co., Inc.	245		
Lovejoy Flexible Coupling Co.	378		
Lovejoy Tool Co., Inc.	92		
Luers, J. Milton	284		
Lynn Mfg. Co.	375		
— M —			
M-B Products	349	OK Tool Co.	117
Machine Products Corp.	242	Oliver Instrument Co.	63
Madison-Kipp Corp.	170	Oliver Machinery Co.	391
Manhattan Rubber Div.	50	O'Neill-Irwin Mfg. Co.	151
Martin Machine Works, J. E.	406	Orlandi Gear & Machine Co.	221
Marvel Tool & Machine Co.	388	Ottemiller Co., Wm. H.	360
Master Mfg. Co.	311		
Master-Taper Co.	373		
Masters Mehry. Supply Co.	407		
Maurey Mfg. Corp.	332		
McDonough Mfg. Co.	349		
Mead Specialties Co.	386		
Metal Carbides Corp.	364		
Metzgar Co.	318		
Meyers Co., Inc., W. F.	368		
Michigan Chrome & Chemical Co.	362		
Michigan Drill Head Co.	236		
Michigan Tool Co.	46, 47		
Miller-Knuth Mfg. Co.	278		
Miller Motor Co.	104, 105		
Millers Falls Co.	313		
Minnesota Mining & Mfg. Co.	116		
Mitchell Co., E. C.	383		
— Q —			
Queen City Machine Tool Co.	238		
— R —			
R. B. Tool Co., Inc.	252, 399		
Racine Tool & Machine Co.	239		
Raybestos-Manhattan, Inc.	50		
Reading Machine Co.	381		

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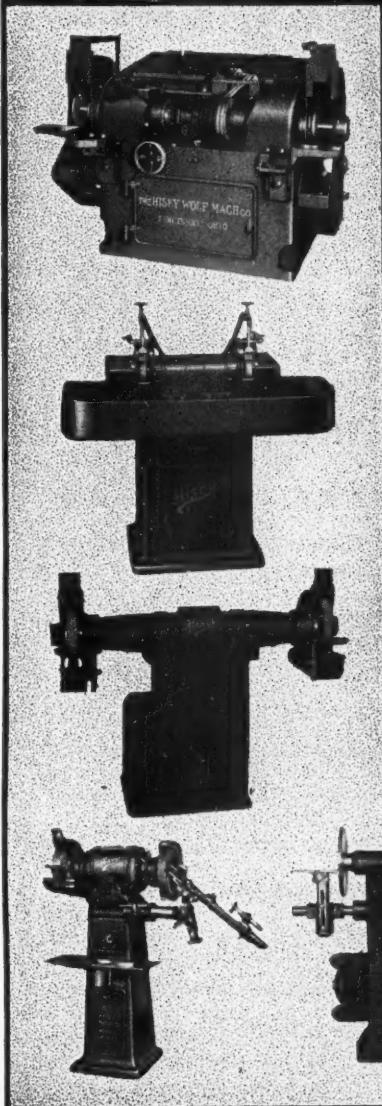
Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

Index to Advertisements

Ready Tool Co.	377
Reid Bros. Co., Inc.	402
Reid Tool Supply Co.	373
Reltool Corp.	343
Rice Pump & Machine Co., Inc.	184
Richards Co., J. A.	383
Rigid Products Co.	393
Rivett Lathe & Grinder, Inc.	361
Roberts Rubber Co., Weldon	55
Rockford Machine Tool Co.	51
Rodgers Hydraulic, Inc.	108
Rogers Tool Co., John M.	347
Rotor Tool Co.	145
Rouse & Co., H. B.	237
Royal Products Co.	408
Ruileta Co., Inc.	325
Ruthman Mchry. Co.	429
— S —	
S & S Hinge & Metal Products Co.	130
Sales Service Machine Tool Co.	412
Sanford Mfg. Corp.	285
Savage Co., W. J.	339
Schauer Mfg. Corp.	158
Scherr Co., Inc., George	355, 391
Schlecht & Son, L. G.	363
Schmidt, Inc., Geo. T.	357, 421
Scientific Lubricants Co.	335
Sebastian Lathe Div., Cincinnati Metalcrafts, Inc.	157
Seneca Falls Machine Co.	23
Sentry Co.	61
Service Machine Co.	216
Services Directory	414
Severance Tool Industries, Inc.	334
Sheldon Machine Co., Inc.	317
Simmons Machine Tool Corp.	331
Simonds Abrasive Co.	103
Simonds Saw & Steel Co.	24, 25
Skilsaw, Inc.	48, 49
Smit & Sons, Inc., J. K.	363
Smith & Sons, George W.	385
Smith Welding Equipment Corp.	233
Snow Mfg. Co.	93
South Bend Lathe Works	193
Speedgrip Chuck, Inc.	230
Sberman Metal Specialties	406
Stackbin Corp.	194
Standard Electrical Tool Co.	76
Standard Gage Co., Inc.	135
Standard Pressed Steel Co.	89, 373
Standard Steel Specialty Co.	365
Standard Tool Co.	251
Starrett Co., The L. S.	155
Sterling Factory Equipment Co.	308
Stone Mchry. Co.	427
Strand Mfg. Co.	373
Strong, Carlisle & Hammond Co.	115
Stuart Oil Co., D. A.	190
Sturdimatec Tool Co.	363
Sturdy Broaching Service	338
Sturtevant Co., P. A.	355
Sub-Zero Products	147
Sundstrand Machine Tool Co.	42
Sundstrand Magnetic Products Co.	283
Superior Hone Corp.	340
Superior Indicator Co.	377
Syntrol Co.	380
— T —	
Taft-Peirce Mfg. Co.	419
Tamms Industries, Inc.	302, 387
Teeter, C. B.	304, 401
Thermo Electric Mfg. Co.	296
Thriftmaster Products Corp.	346
Tietzmann Tool Corp.	397
Tori Mfg. Co.	303
Troyke Mfg. Co.	30
Tubing Appliance Co.	370
Twentieth Century Mfg. Co.	188, 206
— U —	
Union Twist Drill Co.	235
U. S. Automatic Box Mchry. Co., Inc.	381
U. S. Drill Head Co.	374
U. S. Industrial Tools	413
U. S. Steel Supply Co.	423
Universal Engr. Co.	176
Up-To-Date Tool Co.	397
— V —	
V & O Press Co.	363
Van Keuren Co.	263
Van Products Co.	389
Vascaloy-Ramet Corp.	173
Verson Allsteel Press Co.	394
Victor Mchry. Exchange, Inc.	409
Viking Industries	74
Viking Tool Co.	60
Vimeo Mfg. Co.	387
Vinco Corp.	269
— W —	
Wales-Strippit Corp.	118, 119
Walker Co., Inc., O. S.	417
Walker-Turner Div.,	
Kearney & Trecker Corp.	44
Walls Sales Corp.	324
Waltham Machine Works	350
Walton Co.	299
Wardwell Mfg. Co.	152
Warner & Swasey Co.	27
Watts Bros. Tool Works	377
Weldon Tool Co.	366
Wells & Sons, W. F.	224
Wesson Products Co.	85, 243
Westinghouse Air Brake Co.	121
Whistler & Sons, Inc., S. B.	4
Whitney Mfg. Co., W. A.	327
Whitney Metal Tool Co.	400
Whyte Engr. Co.	401
Wicaco Machine Corp.	351
Wiedemann Machine Co.	64
Wilson Mechanical Instrument Co.	95
Wilton Tool Mfg. Co.	306
Winter Bros. Co.	436
Wittek Mfg. Co.	106
Wood & Spencer Co.	384
Woodworth Co., N. A.	297
Wright & Sons, Greg. G.	387
— Z —	
Zagar Tool, Inc.	396
Zeh & Hahnemann Co.	339
Zeiss, Inc., Carl	412
Ziegler Tool Co., W. M.	290

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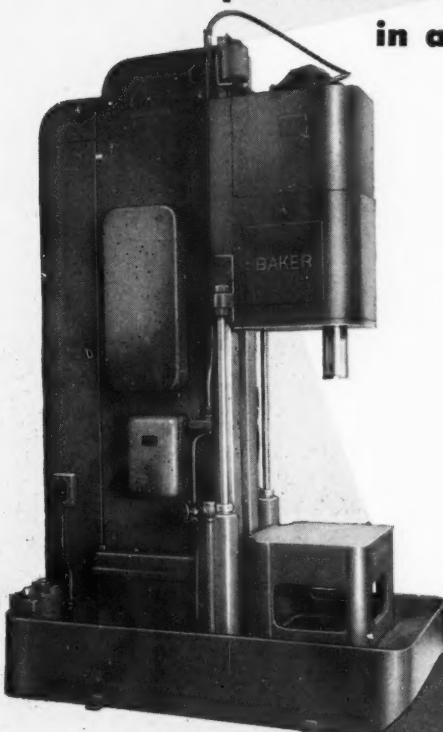
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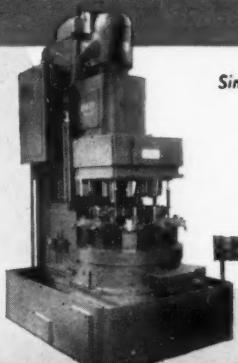


Illustrations show Baker 36HO as adapted for drilling wrench bodies for a leading manufacturer of crescent wrenches. Estimated production rate is 103 parts per hour at 100% efficiency. Machine is easily converted for operations on varying sizes of wrenches.

The standard Baker 36HO Heavy Duty Vertical Hydraulic Drill may be adapted to a multitude of multiple or single spindle drilling, boring, counterboring, spot facing or reaming operations. Provision for pick-off speed changeovers gives extreme flexibility of spindle speeds. The machine is of hydraulic saddle type feed and may be furnished with either standard plain table or indexing table with up to six indexing stations. Ample capacity is provided to drive one 5 inch diameter High Speed twist drill, drilling from solid in SAE-1035 steel. Write Baker concerning your specific job problem.

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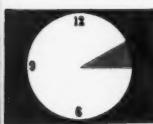
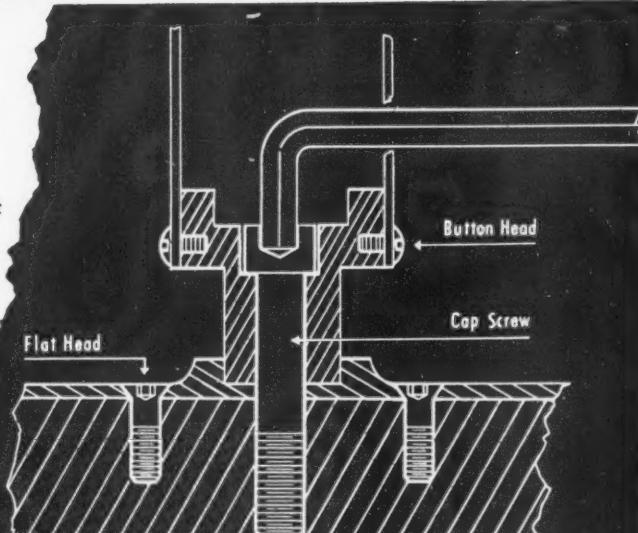
HK Internal Wrenching solved it!

Problem . . .

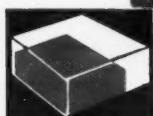
- Primary fastening point located in narrow channel with minimum clearance for fastener head.
- All fasteners must permit high torque application to insure permanent rigidity.
- Fasteners must not deform under frequent tightening and loosening. Must have high fatigue resistance.

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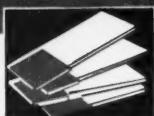
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